SCIENTIFIC AMERICAN

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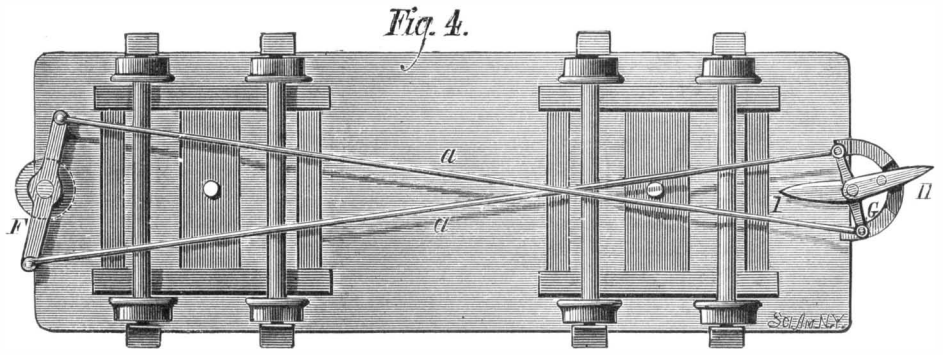
A NEW SWITCH CONTROLLER.

The frequently recurring accidents caused by misplaced switches have suggested a field for invention, to which—especially since several notable accidents due entirely to this cause—inventors have turned their attention, and with considerable activity have produced devices for avoiding these accidents. Perhaps the simplest of these devices is the switch controller shown in the accompanying engravings, and recently patented by Mr. Henry Greenway, of Brooklyn, N. Y.

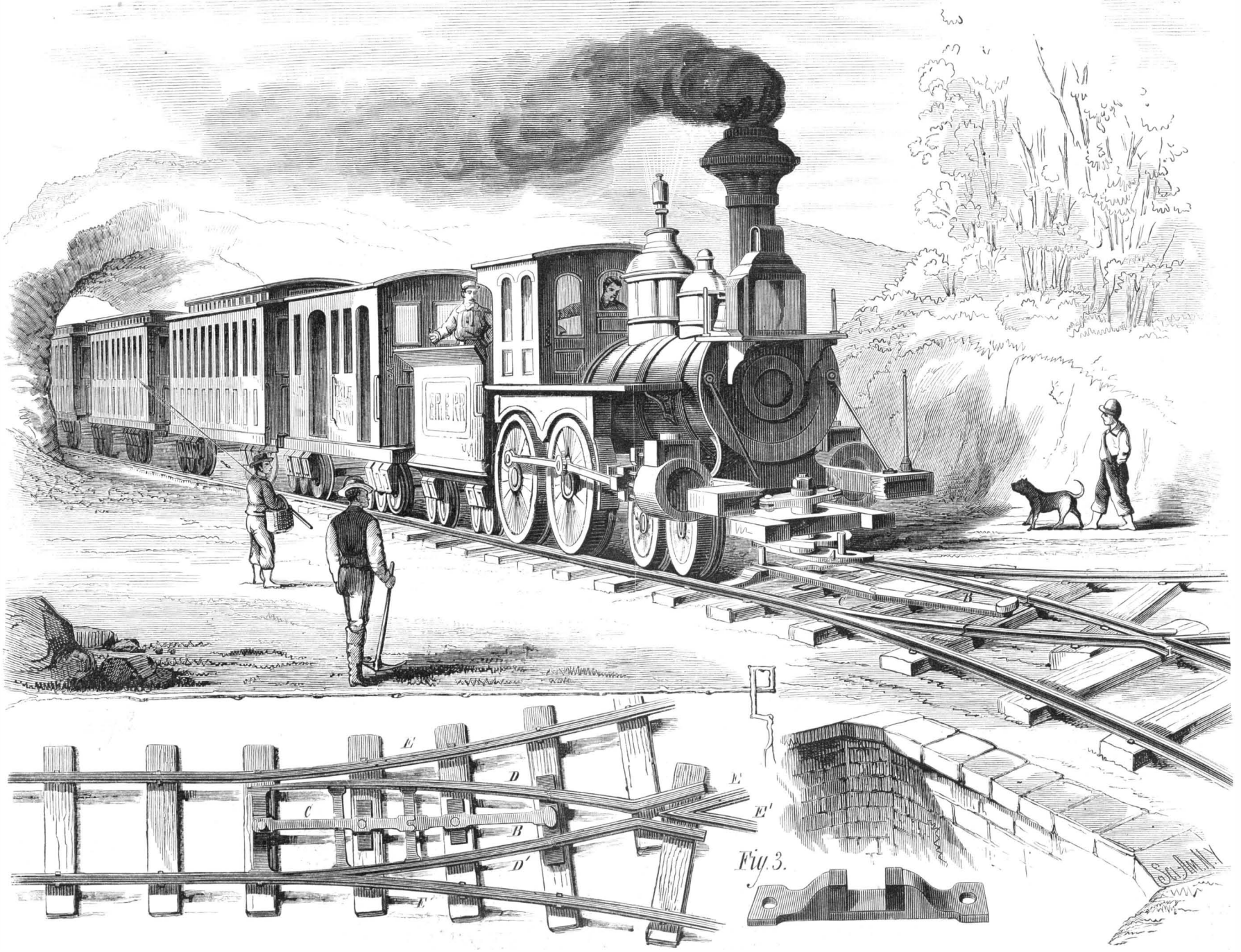
In this apparatus the entire management of the switches is placed in the hands of the engineer, who controls them by means of a simple lever in the cab of the engine. So far as the fittings of the engine are concerned they are of the simplest character. A lever in the cab, which is provided with a curved rack and detent much like the reversing lever of the engine, is connected by a rod with a lever at the upper end of a short vertical shaft, journaled in suitable boxes in the cross piece of the pilot truck. To the lower end of the vertical shaft is secured a lever, A, whose forward end is tapered and somewhat rounded, while its rear end is shorter and thicker. This lever the inventor calls a rudder.

The track, the arrangement of which is also very simple, is shown in plan in Fig. 2. E E are the branch rails, and E′ E′ the rails of the main track. The movable switch rails, D D′, are pivoted at the frog and connected so that they move together. Between the switch rails there are two levers, B C, which are pivoted to the tie beams and jointed together. The lever, B, is connected with the movable switch rails, and the lever, C, extends into a notched buffer block placed on one of the ties midway between the rails of the main track. At this point in the lever, C, a stud stands up high enough to be engaged by the rudder, A, as the pilot truck of the locomotive approaches the switch. Moving the rudder, A, one way or the other by means of the lever in the cab, determines the direction to be taken by the locomotive by moving the switch rails to the right or left through the levers, C B. The tender is fitted with a contrivance similar to that on the engine, so that when the engine runs with the tender ahead, the switch may be operated equally as well. The arrangement of the levers, rods, and the rudder is shown in the inverted plan view, Fig. 4. F is a lever at the forward end of the tender, which is connected with the rudder lever, G, by two rods, *a*. In this case the rudder has a movable portion, H, and a fixed portion, I. It will be seen that the entire control of the switch is in the hands of the engineer, who has more anxiety as to the safety of his engine and train than any one else could have. It is the belief of the inventor that switch tenders under the existing systems have either too much or too little to do. Having too much, he is liable to become confused; having too little, he is liable to become negligent. In all motors, with the exception of the locomotive, the power of guiding has been vested in the driver or pilot. Mr. Greenway has attempted to give locomotive engineers the same power, so that there should be no mistakes as to the direction to be taken by the engine. Mr. Greenway has a very pretty working steam model for exhibiting his invention at his office, No. 34 Park Row, room 30, New York city.

Fig. 4.



GREENWAY'S SWITCH CONTROLLER.



GREENWAY'S SWITCH CONTROLLER.

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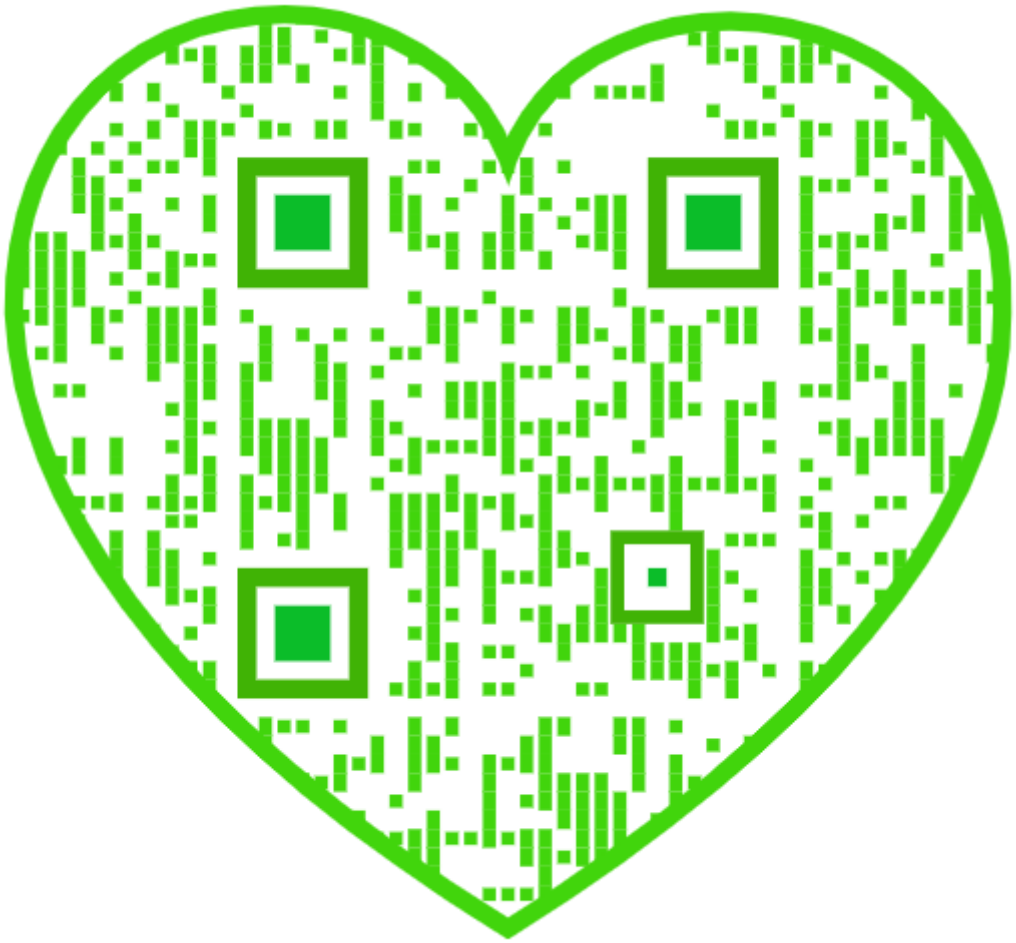

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NEW YORK, SATURDAY, JUNE 28, 1879.

Contents.

(Illustrated articles are marked with an asterisk.)

Amateur mechanics*..... 404
American products in England . 405
Australian exhibition 401
Barometer, rules for [8] 409
Bed, invalid, new*.... 408
Brass, porous castings [10]..... 409
Brewers' convention 401
Cement, minerals to wood [6] ... 409
Citric acid..... 400
Clay, to keep moist [5].... 409
Collodio-bromide 403
Condenser, water for [16]..... 410
Cyclode, the*..... 407
Device for cattle stalls*..... 407
Earth, virgin, not malarious [2].. 409
Electric lamp, Krupp*..... 502
Electric pen, new*..... 408
Elevators, American in Europe.. 401
Eruptions, volcanic. 403
Expansion joint in steam pipe [25] 410
Flowers, natural, to preserve [7]. 409
Horsechestnut in rheumatism... 402
Ice, artificial..... 405
Insects as medicine. 401
Inventions, agricultural, new.... 408
Inventions, mechanical, recent.. 405
Inventions, miscellaneous..... 404
Iron industries of Leeds 405
Laburnum poison, property of... 407
Legal practice in London 406
Memphis, ancient..... 402
Neuralgia, treatment of 406
Oil wells and their products..... 402
Paraffin from a pine 404
Pen, electric, new*..... 408
Photography, blue process[14] . 409
Physicians, Chinese..... 406
Pianos, strain on [19] 410
Pigment process, new 403
Pile hammer, force of [22] 411
Plants, cross-breeding 407
Prevention better than cure..... 403
Reporting machinery..... 407
Rotary engine new*..... 406
Saw, shop, new..... 403
Schools, country 405
Sealing compound [3] 409
Shad in Arkansas 405
Silvering, process of [15]..... 409
Silver powder, to make [12]..... 409
Sounder, new*..... 408
Spiders and ants..... 407
Steam gauge, siphon of [24]..... 410
Steamship Arizona, new..... 401
Steamship Scotia 408
Sugar manufacture impr in.... 400
Switch controller, new*..... 399
Table moving [18] 410
Telephone in church 403
Tide water oil pipe line..... 400
Tongue, fur on the..... 408
Violin, rosin [11]..... 409
Volcanic eruptions..... 403
Volume XL. 400
Water wheel, current [23]... 410

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 182,
For the Week ending June 28, 1879.

Price 10 cents. For sale by all newsdealers.

I. ENGINEERING AND MECHANICS.—A Pneumatic Excavator. Made for the Government of New South Wales for use in the improvement of the harbor of Sydney.

English Railway Accidents. Summary of accidents and their causes during the first quarter of 1879.

Simon's Gas and Steam Motor. Fig. 1, Motor as shown at Paris. Fig. 2, a new type of gas and steam motor. Fig. 3, details of upper part of compression cylinder. Fig. 4, transverse section.

Millstone Dressing Machines, 1 figure. The Dupety diamond millstone dressing machine.

A Steam Sharpie Yacht. By H. K. STROUD. Details of construction, 1 figure showing boiler.

Use of Compressed Air Motors for Street Cars. Report of General H. Haupt, C. E. Objections and answers. The moral and sanitary influences of the pneumatic motor. Comparative cost. Cost of motor on Second Avenue Railroad. Consequences. Trial trip observations.

How Money is Made. By A. E. OUTERBRIDGE, Jr. A study of the operations of the United States mint. The analysis. The refining process. The mechanical processes. The coining.

II. TECHNOLOGY.—Sculpture in Gold and Ivory. Ancient Greek work. A lost art.

Notes on Porcelain Painting. By VICTOR JOCLET. Methods of preparing blues.

Dyeing Receipts. For silk, cotton, woolen, and jute.

Manufacture of Potash and Chloride of Methyl from the Dregs of "Treacle." By M. CAMILLE VINCENT.

Distillation of Coal Tar. Preparation and uses of coal tar products.

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III. CHEMISTRY.—Recent Chemical Inventions. Manufacture of sulphuric acid. Lubricating oil. Waterproof paper. New colors. New paper glaze. Improvement in the production of ammoniacal salts. Utilization of caoutchouc oil. Process for coating silk yarns with metals.

Purification of Mercury. Prof. Lothair Meyer's process. 1 figure.

A New Compound of Silicium and Strontium.

Effects of Superoxide of Hydrogen on Iodide of Potassium.

Aluminum Alcohols.

On the Products of Oxidation of Volatile Nitro-Phenol Oxide.

IV. ELECTRICITY AND MAGNETISM.—Electro-Magnets. The most minute, complete, and practical description of electro-magnets and armatures ever printed. Prepared expressly for the SCIENTIFIC AMERICAN SUPPLEMENT. 51 figures. Showing the construction of every form of electro-magnet in use.

An Electric Blow Pipe.

A Liquid Current Interrupter.

The Aurora.

V. ARCHITECTURE.—The Spire of La Giralda, Seville, Spain. Full page engraving of the famous Moorish Tower at Seville, begun A.D. 1000, finished A.D. 1569.

VI. MISCELLANEOUS.—Dyed Cocoons.

Porosity of Stone.

Disastrous Earthquake in Persia.

SIX MONTHS OF SCIENTIFIC PROGRESS.

The scientific and industrial record of another half year is completed with this issue of the SCIENTIFIC AMERICAN. It is believed that no scientific enterprise of popular interest, no notable occurrence, no great industrial undertaking, no important discovery or invention—in short, nothing pertaining to the world's best thought and action during the past six months has failed of timely notice in these pages, while in character and number the illustrations which have given instruction as well as pleasure to our readers are such as to compare favorably not only with those of the preceding volumes of the SCIENTIFIC AMERICAN, but those of any other popular journal ever published.

When Volume XL. was begun there still prevailed in many quarters no little doubt and misgiving with regard to the immediate industrial future. The confidence expressed by the SCIENTIFIC AMERICAN in the continued improvement in American industrial affairs has been happily justified; and there is every reason to believe that the prediction that the country was entering upon an era of unexampled prosperity will but feebly express the ultimate fact. The threatened derangement of our manufacturing industries, through the alteration of the patent laws in a way to affect injuriously the rights of inventors and patentees, was fortunately averted, we trust permanently, by the failure of the obnoxious Senate bill 300; and we hope that the public sense of justice and sound policy which frustrated that scheme will prevent a renewal of the attempt next winter.

The steady improvement in the American export trade has been almost as marked a feature of our recent history as the marked improvement in domestic trade. Particularly noticeable has been the outspoken acknowledgment of the superiority of many American products by English and European statesmen and manufacturers, and the frank admission by them that the industrial supremacy of the world lies in the near future with America.

Among the notable improvements in the arts brought forward recently, mention may be made of Barff's process of obtaining a protective coating to iron, Holloway's utilization of the sulphides in ores as fuel, and the new composition for the lining of Bessemer converters, making possible the use therein of phosphorus bearing ores.

The completion of the Sutro Tunnel, the progress on the tunnel of St. Gothard, and the completion of the Joseph II. Mining Adit, are perhaps the most notable achievements in engineering that will occur to our readers. The meeting of the International Interoceanic Canal Congress at Paris promises to mark an important date in the history of man's victories over nature, but its significance can be determined better a dozen years hence.

In pure science there is nothing more important than the investigations of Prof. Crookes with regard to the behavior of electrified molecules in vacuo. His observations are certainly curious, his methods are extremely delicate and skillful, and the results obtained are wonderfully suggestive. What more may come of them the future only can determine.

Among the more important inventions our readers will recall Cowper's writing telegraph and Edison's loud speaking electro-chemical telephone.

Six months ago popular attention was very strongly drawn to the development of the electric light, and something of a panic prevailed among the holders of gas stocks. That flurry has blown over. The electric light has not fulfilled its promises, and Mr. Edison's assertion that his latest lamp is a complete success falls on indifferent ears. The world is not so eager for the change as it appeared, and on all sides the disposition is to await developments patiently. Possibly after all the "light of the future," suggested by the SCIENTIFIC AMERICAN several years ago, and recently worked out practically by Molera and Cebrian, may prove the final solution of the problem.

Among the false lights of the immediate past mention may be made of the extremely confident but suddenly extinguished pretensions of the Hosmer and Gary motors. Instead of revolutionizing the industries of the world by force self-generated, they have dropped out of sight with the thousand other motors of the impossible sort. To which class we may properly add also Mr. Keeley's machine for the utilization of "inter-molecular etheric substance."

In this hasty glance at the salient features of the work of the past six months notice may be taken of two or three which we are confident have added not a little to the interest and value of the SCIENTIFIC AMERICAN. These are the series of illustrated articles on our leading industries; the papers on amateur mechanics, with their practical suggestions and numerous illustrations; and the specially admirable illustrations of natural history. Nothing finer than the last have ever been given in a popular periodical. It is perhaps needless to add that the constant aim of the publishers of the SCIENTIFIC AMERICAN is and will be to make this paper, so far as practicable, a perfect and impartial record of scientific and industrial progress the world over.

CITRIC ACID—FROM THE LIME AND LEMON.

The source of profit in the cultivation of the lime and lemon, which we have recently had occasion to point out (p. 339), has evidently attracted the attention of many of our southern fruit growers, judging from the number of communications and inquiries we have since received respecting the industry.

For the benefit of those interested in the matter we give the following outlines of the process for obtaining the citric acid from these fruits·

After removing the seeds and peel, the fruit is subjected to strong pressure—a good cider press answers very well on a small scale. The expressed juice is then evaporated in copper or leaden pans (porcelain enameled iron vessels would be less objectionable) at a temperature not exceeding 150° Fah. until it has a density of about 1·23, when it is a dark, thin sirupy liquid containing from 27 to 32 per cent of citric acid.

An instrument termed a *citrometer* is sometimes used to measure the amount of citric acid in the fluid, but the method cannot be relied on, owing to the variable amount of saccharine and other matters present and to the fact that a small portion of the acid is almost invariably decomposed during the concentration. The concentrated juice usually comes into market in casks containing about one hundred gallons.

To obtain the citric acid from the juice it is first clarified by filtration, heated to about 200° Fah. in a lead lined vat, by means of steam circulating in a coil of leaden pipe arranged around the inner side of the vessel. Powdered whiting (lime carbonate, chalk) is then gradually added until the acid is fully saturated, a point readily determined by its ceasing to effervesce. The whiting must be added in small quantities, suitable to the amount of liquor under treatment, and the mixture kept constantly agitated by machinery until the whole of the acid present is converted into insoluble calcium citrate. The mixture is then allowed to settle, after which the supernatant liquid is drawn off and the residue repeatedly washed with warm water, by decantation, the agitating apparatus being set in motion after each addition of fresh water.

The washed citrate is then transferred to a similar vessel, where it is agitated with hot dilute sulphuric acid in the proportion of about 9½ parts of strong acid diluted with six times its weight of water, to every 10 parts of whiting previously used. By this treatment the calcium citrate is decomposed, sulphate of lime and free citric acid being formed. The mixture is drawn off into a settling tank in which the heavy sulphate subsides, while the clear solution of citric acid is drawn off into lead lined vacuum pans, where it is concentrated by steam heat. The concentrated solution of citric acid is then passed through canvas bag filters usually containing a small quantity of boneblack, previously freed from phosphate of lime by dilute hydrochloric acid. The filtrate runs into crystallizing pans placed beneath, in which it stands until the crystals cease to form.

The mother liquors are run back into the crystallizing pan, and the crystals are dried in a centrifugal machine, or by other suitable means.

The article thus obtained is sufficiently pure for ordinary purposes, and represents the citric acid of commerce.

It is largely used by the dye calico printer as a "resistant" for iron and alumina mordants. When required for other purposes it is necessary to purify it by recrystallization.

Citric acid to be used for medicinal purposes or for effervescing drinks, etc., should be prepared in vessels of earthenware, porcelain, or porcelain-enameled iron, as it is apt to contain traces of lead if prepared in leaden vessels.

THE TIDE WATER OIL PIPE LINE COMPLETED.

The first flow of oil from the Bradford oil district reached Williamsport, Pa., June 4. Only a few trifling leaks have been discovered in the entire length of the pipe, or over a hundred miles. The line starts at Williamsport and runs slightly north of west over the mountains into Potter county and on to Coryville, or Frisbie, the initial point, in McKean. It passes over a high range of mountains near the village of Waterville, at the forks of Pine creek, where great difficulties were overcome in laying the pipe.

There are tanks at Coryville and a pumping station. The next pumping station is at a point about four miles from Coudersport, where tanks have been put up and buildings erected for the engine, etc. The distance from Coryville to pump station No. 2 is 22½ miles; from there to Williamsport is 77½, and the oil when raised 1,200 feet at the summit, runs down to Williamsport of its own gravity, as the fall is 2,100 feet. The pumping engines are forty horse power each, and each has an equal share of the lifting to do in the way of the application of power. The pipe is six inches in diameter, and required 28,000 barrels of oil to fill it. At Williamsport receiving tanks holding nearly 60,000 barrels had been provided, and seventy oil cars were in readiness to transport the first flow of oil over the Reading railroad. The capacity of the pipe line is about 6,000 barrels per day, and if everything works according to the anticipations of the company, it may become necessary before the close of the season to build another line.

IMPROVEMENT IN SUGAR MANUFACTURE.

A sugar planter and manufacturer sends to the Martinique *Bienpublic* an account of an experimental application to sugar cane of the diffusion process employed in the beet sugar factories of France and Germany. The experiments were made at the plantation Moncepos, Guadaloupe, with an apparatus of six macerators. It was badly adapted to meet the difficulties incident to the peculiar nature of cane, yet it showed (1) that by a methodical washing of the slices of cane an artificial juice nearly equal in density to natural cane juice could be obtained; and (2) that one hour of systematical maceration is sufficient to completely exhaust the cane fiber of the sugar with it contains.

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The yield of sugar in these experiments was from 12½ to 13 per cent of the weight of the cane, in white sugar.

A comparison of the diffusion process, imperfectly carried out, with other processes, shows as follows:

Extraction by rollers, as still practiced on a great number of plantations, obtains:

Raw sugar, crystallized (or 65-180, equal to 36 per cent of total sugar contained in cane.)	65
Sugar in the state of molasses	25
Sugar lost in the bagasse	90
	180

By perfected roller mills:

Sugar obtained, crystallized (or 108-180, equal to 60 per cent of the total sugar contained in the cane.)	108
Sugar in the state of molasses	32
Sugar lost in the bagasse	40
	180

By the diffusion process:

Sugar obtained white, crystallized (or 130-180, equal to 72 per cent of the total sugar contained in the cane.)	130
Sugar in the state of molasses	40
Losses	10
	180

The advantages realized by diffusion can therefore be summed up as follows:

Over the perfected presses, 72—60, equal to 12 per cent; over the not perfected presses 72—36, equal to 36 per cent. We shall therefore obtain a surplus of 12 to 36 per cent upon the total weight of sugar in the cane; or in other words, the production will be increased one fifth of the sugar obtained in the first case, and in the second case it will be doubled.

The molasses will be of a better quality, being less colored and of a more agreeable taste.

THE BREWERS' CONVENTION.

The nineteenth annual convention of the United States Brewers' Association began in St. Louis, Mo., June 4. This association represents 2,830 breweries, of which New York has 405, Pennsylvania 383, Wisconsin 248, California 213, and Ohio 207.

The sale of beer for the year ending June 30, 1878, was the largest ever known, being 9,473,361 barrels, which was 313,685 barrels more than the next largest in any fiscal year, that ending June 30, 1876. The figures for the first nine months of the present year indicate that fully 10,000,000 barrels will be sold. Of this the breweries of New York produce about a third.

The export trade in American beer is rapidly increasing, a committee report giving the figures as follows:

EXPORT OF BEER OF DOMESTIC PRODUCE.

	In Bottles. Dozens.	In Bottles. Value.	In Casks. Gallons.	In Casks. Value.
1870	1,076	$2,250	66,467	$23,759
1874	2,897	6,245	99,135	33,357
1878	76,475	108,279	119,579	38,918

Meantime there has been a remarkable falling off in the importation of beer, as will be seen by the following table:

IMPORTATION OF FOREIGN BEERS INTO THE UNITED STATES.

	Gallons.	Value.
1875	2,167,251	$1,742,120
1876	1,490.150	1,161,467
1877	974.277	758,850
1878	767,709	592,707

THE AUSTRALIAN EXHIBITIONS.

A bill has been passed by Congress authorizing the President to appoint Commissioners to represent the United States at the International Exhibitions at Sydney and Melbourne, Australia, and appropriating $20,000 for such representation at either or both of them. As the Sydney Exhibition opens in August next this action comes too late to accomplish much there. It is to be hoped that a more generous appropriation may be made for the Melbourne Exhibition, to be held between October 1, 1880, and May 31, 1881. The Australian exhibits at the Centennial Fair were among its most interesting features; and sound commercial policy as well as courtesy warrants something like a corresponding effort to have the United States becomingly presented to the Australians.

THE NEW STEAMSHIP ARIZONA.

The largest merchant steamer afloat, next to the Great Eastern, is the new steamship Arizona, of the Williams & Guion Line, plying between New York and Liverpool. The Arizona was built by Elder & Co., of Glasgow, and is of exceedingly fine model.

She is 465 feet in length, 46 feet beam, 37½ feet depth of hold, and close upon 6,000 tons burden. Her engines are the latest improvement on the compound principle, there being one high and two low pressure cylinders of an indicated horse power of 7,000. She is propelled with a four bladed screw, 23 feet in diameter, with a pitch of 33 feet. The steam is generated by seven double ended boilers, and the consumption of coal is estimated at about one hundred tons per day for full steaming purposes. There are on the main deck five powerful steam winches, with double gearing steam capstan for working the anchor, etc. She is steered from the bridge by steam, and in case of accident is fitted up with the usual manual steering gear in a wheel house, protected by a strong iron turtle back deck. There are also steam pumps and a powerful engine, by which any quantity of water can be brought to any part of the ship in a few seconds. The appointments for the convenience and comfort of passengers are superior, steerage accommodations particularly.

INSECTS AS MEDICINE.

According to our medical exchanges the latest sensation in the way of a materia medica is the *Blatta Orientalis*, or in less scientific language, the cockroach, which comes this time, as it did once before, from Russia. Bogomolow is the name of the person who has investigated it. The beetle, dried and powdered, is given in doses of four and a half grains in Bright's disease, chronic or acute. But it appears that this is not the only thing that the insect is good for, since Unterberger and Kochler are said to have used it with great success in various forms of dropsy.

Kirby and Spence point out the fact that many insects emit very powerful odors, and some produce extraordinary effects upon the human frame, and for this reason, say they, it is an idea not altogether to be rejected that these animals may concentrate into a smaller compass the properties and virtues of the plants upon which they feed, and thus afford medicines more powerful in operation than the plants themselves.

Setting aside the preliminary observation in regard to "powerful odor," such a notion can scarcely have reference to the cockroach, the favorite food of which is the bedbug, or, such pabulum failing, almost anything from a minced pie down to an old boot. What particular medicinal alkaloid the insect's digestive apparatus can eliminate from such a mixed diet it would be difficult to determine. The homœopathic pharmacist, however, has long been accustomed to obtain the concentrated strength of some such active principle by triturating the *blatta* down to its ultimate molecule with sugar of milk. By reference to a homœopathic work on symptomatology we find that "provings" show that this insect, when administered to the healthy subject, causes laziness, which certainly is an extraordinary effect to be produced by so agile a beetle. A high potency of the bedbug is obtained by means of the same manipulation, although the resulting trituration is better known to the followers of the school just mentioned as *Cimex lectularius*. In this comminuted form the bug is found beneficial in fevers of various sorts. But this same delectable insect has also found favor in another practice, used *in puris naturalibus*, and five or six of the bugs being administered for a dose as a cure for chills; and it has likewise enjoyed some notoriety as an emmenagogue. Another insect, not usually mentioned in polite society, also enters into the homœopathic list of remedies, and this is the head louse (*Pediculus capitis*). "Provings" show that this insect has a remarkable cerebral tendency (as we might suppose), and hence its use is indicated in various forms of severe headache, accompanied by nausea and vertigo.

It is curious to look back at the list of *materiæ medicæ* of olden times, when, with vipers, toads, etc., insects held a prominent place, and were administered with as much confidence in their remedial effects as is now bestowed on the vegetable and mineral medicines of the present practice. In those days powdered silkworms were esteemed as invaluable remedies for vertigo and convulsions; earwigs were given to strengthen the nerves; and five gnats were equivalent, as a purge, to three grains of calomel. Bees dried and pulverized were believed to cure the falling out of the hair (*Alopecia*), and were also administered internally to promote urine; and for the latter purpose the triturated insects are now used by the homœopaths. These insects, say they, are similar in their action to cantharides, and often succeed when the latter fail. "Still," says the editor of *Hull's Jahr*, "we have often seen them fail in our own and others' hands, when they seemed fully indicated." Again, in the olden time, powdered scorpions were regarded as an infallible panacea for stone and gravel; and fly water was none the less esteemed as a collyrium in various affections of the eye. The tick was good for erysipelas, and the wasp, from its direct action on the mucous lining of the kidneys and on the neck of the bladder, was a most invaluable diuretic. The ladybird (*Coccinella*) was esteemed as a sovereign remedy for colic and measles, and crushed upon an aching tooth was long regarded as a specific for toothache. The same insect (*Coccinella septempunctata*) is now officinal in the homœopathic pharmacopœia, and in the form of a trituration is supposed to be useful in swelling of the gums and toothache accompanied by dull headache. Gerbi, a learned Italian professor, assures us that if a finger be once imbued with the juices of a little insect rejoicing in the sesquipedalian name of *Rhinobatus antiodontalgicus*, it will thereafter retain its power of curing the toothache for a whole year.

In former days ants were celebrated as specifics against leprosy and deafness, as well as for their aphrodisiac virtues; distilled with spirits of wine they formed the *Aqua Magnanimitatis* of ancient medicine, a liquor which was believed to give vigor and animation to the whole bodily frame. The same extract of ants was also considered efficacious in strengthening the memory and increasing the power of loving, and it likewise prevented paralysis and cured ringing in the ears, etc. The chrysalides of ants were said to be diuretic, and they have been used in dropsy. A preparation called "spirit of ants" (*Spts. Formicarum*) is officinal in the German pharmacopœia, and was formerly much used internally as a stimulant, just as ammonia is usually employed; but formic acid, which is the active agent in the preparation, is not now regarded with favor by the medical faculty, and is little used.

The cockchafer (*Melolontha*) of Europe was once highly esteemed as a remedy for the bite of a mad dog and the plague. Dioscorides is authority for the statement that a plaster of spiders applied to the temples will keep off ague; however this may be, it is certain that these insects are occasionally used as an internal remedy, in pill form, for a like purpose in some of the Southern States. Triturations and tinctures of one or two species of spiders (especially the *Epeira diadema*) are officinal in the homœopathic pharmacopœia. Speaking of spiders reminds us that one species (*Tegenaria medicinalis*) has been largely employed in the United States instead of the Spanish fly.

The cochineal insect (*Coccus cacti*) was formerly regarded as a stimulant, antispasmodic and diuretic, and still enters into an old fashioned prescription for whooping cough; but its remedial virtues are so doubtful that it has dropped from the rank of a medicine to that of a mere coloring agent for medicinal preparations. In this capacity, however, it regains something of its lost prestige, for the deeper the tint of the preparation colored with it the stronger the medicine in the imagination of the average patron of the drug store. A similar insect is the kermes (*Coccus Ilicis*), indigenous to the basin of the Mediterranean, officinal in the French Codex, and used for the same purposes as the foregoing.

The only insects that have really managed to hold their own in the struggle for existence in the good graces of the regular practitioner, are the blistering beetles (*Cantharis, Mylabris*, etc.). These are still extensively used, both as external and internal remedies. In Europe we believe that the Spanish fly (*Cantharis vesicatoria*) is, with one exception, the only species used; but in the United States, although this same species is almost universally employed, yet several of our American blistering beetles have often been substituted for it with perfect success; these being the striped (*Lytta vittata*), the ash colored (*L. cinerea*), the black (*L. atrata*), and the margined blister beetles (*L. marginata*). In China the *Mylabris cichorii* has long been employed, and seems also to have been considered the most powerful vesicatory among the ancients, who, however, appear to have been likewise acquainted with the golden cetonia (*Cetonia aurata*) and some others mentioned by Pliny. A species of *Mylabris*, very abundant in Bengal, Bahar, and Oude, has been found equally as efficient as the common Spanish fly; and, in other parts of India, the giant cantharis (*C. gigas*) and the violet colored cantharis (*C. violacea*) are used, as is the red headed blister beetle (*C. ruficeps*) in Java and Sumatra. In Brazil the species used is the *C. atomaria;* in Arabia, the *C. Syriaca;* and in some parts of Europe the *Mylabris trimaculata* is employed. The use of one of the blister beetles, the *Meloe proscarabæus*, was long ago recommended as an antidote to hydrophobia, and a pamphlet on the subject was communicated to the Entomological Society of France by M. Fermaire in 1856; more recently, we have seen it stated that this is a favorite remedy of the Arabs for the same disorder, the beetles employed being *Meloe tuccius* and *Mylabris tenebrosa*, and the dose being a piece the size of a grain of wheat given to the patient in a piece of meat. Prepared as a trituration, the Spanish fly is used in homœopathic practice for a like purpose.

Such, then, are a few of the singular remedies that the *ars medica* has from time to time made use of. And now the question arises, Will these insect remedies ever come in vogue again? Will they ever partially replace the many roots, herbs, and barks which, in one form or another, make up our present materia medica? Perhaps so; who knows? A well known medical author writes thus: "There exists a fashion in medicine, as in other affairs of life, regulated by the caprice and supported by the authority of a few leading practitioners, which has been frequently the occasion of dismissing from practice valuable medicines and of substituting others less certain in their effects and more questionable in their nature. As years and fashions revolve, so have these neglected remedies, each in its turn, risen again into favor and notice, while old recipes, like old almanacs, are abandoned until the period may arrive that will once more adapt them to the spirit and fashion of the times." So, then, it may be that the coming cockroach is but the precurors of the "innumerable caravan" of bedbugs, coakchafers, ants, *pediculi*, and others, that are again moving to the front to assert their right to heal man, instead of being a pest to him. And it may be, too, that, based on this practice, a new "pathy" shall arise to supplant one or more of those now in existence, and which shall be called entomopathy. As we before remarked, who knows?

American Elevators in Europe.

We have seen a recent letter from Mr. Petrus Regout, owner of the celebrated glass manufactory at Maastricht, Holland, who states that he has lately put up in his establishment an American elevator, made by Volney W. Mason & Co., of Providence, R. I., which gives entire satisfaction. According to Herr Regout, they subjected the safety devices of the elevator to the following severe test: The platform, which of itself weighed 480 kilos, was loaded with a special weight of 500 kilos more, and the lifting rope was then suddenly cut; but the platform did not fall, being firmly held up by the safety racks. M. Selig & Co., Berlin, the well known engineers, have taken the agency for Messrs. Mason & Co.'s elevators, and are now introducing them in Germany. The above is one of the first practical trials they have had.

Snow and Frost in June.

Severe frost was experienced along the northern tier of States toward the close of the first week in June, and on the 6th snow fell at North Troy, Vermont, and at Sandwich, New Hampshire.

THE eruption of Mount Etna has nearly subsided.

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THE KRUPP ELECTRIC LAMP.

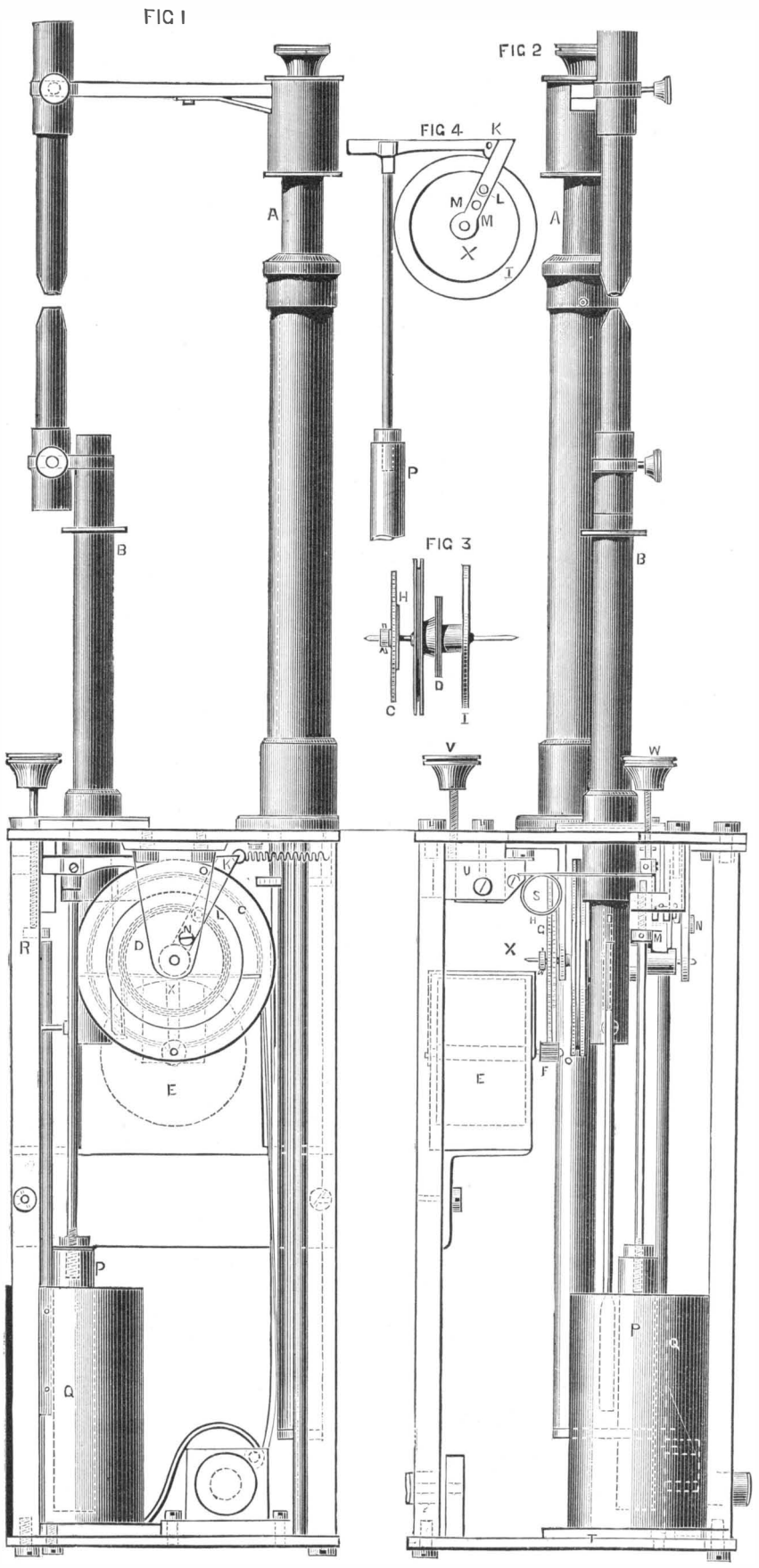
Herr von Krupp, of Essen, has recently patented an invention for "Improvements in Electric Light Apparatus." The main object of the invention is to regulate automatically the position of the carbons of an electric lamp "in a simpler manner than heretofore, without abandoning the generally acknowledged conditions on which the precision of motion of the single parts depends." The invention includes the application of a brake appliance for the automa tic regulation of the distance between the two carbon points. A fan or fly revolves in quicksilver, or other liquid, for the purpose of regulating the motion of the carbon holder, this part of the apparatus being designed as a substitute for clockwork. A magnetic coil with iron casing and iron bottom is employed in connection with the motion of the brake appliance.

Fig. 1, in the engraving, which we take from *Engineering*, is a side elevation, and Fig. 2 a front elevation of the lamp, in which A is the holder for the upper positive carbon, and B the holder for the lower negative carbon. The upper holder, A, is suspended from the disk or pulley, C, by means of a jointed chain or wire, the lower holder, B, being similarly attached to a disk or pulley, D, the latter disk being just half the size of the former. The chains or wires are so passed round the pulleys that when the holder, A, descends a certain distance by its weight, the other holder, B, ascends to half the distance. Accordingly the electric arc formed between the carbon points occupies a fixed position. As the weight of the upper holder, A, must not be too small, because its motion would then be easily influenced by dust and dirt, it is necessary to have an appliance for retarding and regulating its course or travel. For this purpose a fly or fan, E, is applied, which revolves in mercury or other liquid. On the spindle of this fly there is a pinion, F, which gears with a tooth wheel, G, on the spindle, X, of the chain pulleys, C and D. In order that the fly, E, by the insertion of a fresh carbon should not have to revolve backward, the toothed wheel, G, is fitted with a pawl wheel, H.

The setting and regulating of the proper distance between the carbon points is effected in the following manner: On the same spindle, X, as the pulleys, C and D, and tooth wheel, G, there is a disk, I, as shown in the separate view, Fig. 3. Fig. 4 is a separate view of a brake of a peculiar form acting on this disk, I. The brake consists of two parts, K and M, which are jointed together at L. The lower part, M, can turn on the spindle, X, and has a hole, M^1, in which is inserted a small peg, N, Figs. 1 and 2. The peg, N, has much play in the hole, and the backward motion of the brake is limited thereby. O is a brake block on the upper part, K, of the brake; P is the keeper for an electro-magnetic coil, Q. This keeper is by a brass rod suspended from the other end of the part, K.

When the lamp is in action the keeper, P, is drawn into the coil, Q, whereby the brake block, O is pressed against the disk, I, turning the latter in its further movement downward, that is, so far as the set screw, R, Fig. 1, will allow. Thus, the upper carbon point will be raised, and the lower carbon point lowered, and the electric arc then makes its appearance. The carbon points now gradually consume away, the current becomes weaker, and its effect on the electro-magnet, Q, is lessened. The brake, K, supported by the spring, S—the action of which can be suitably regulated in proportion to the strength of the current by means of the lever, U, and set screw, V—and by the weight of the carbon holder, moves slowly back. The brake disk, I, is thereby enabled to turn forward, and the carbon points can approach each other. When this movement has proceeded as far as the brake disk, I, moved back before, then the lower part of the brake comes to bear against the peg, N. By the further weakening of the current, the brake will now turn in its joint at L, the brake block, O, releases the disk, I, and the carbon points move toward each other, whereby the current is strengthened and the brake is again applied to the disk, I, either simply to hold it when the carbon points are in their right position, or to pull it back when the carbon points are too close together. When inserting new carbons, the brake is fixed by the set screw, W, and the work is arrested thereby. The electro-magnetic coil, Q, rests on the bed plate, T, of the lamp, and is surrounded by an iron casing, whereby its power of attraction for the keeper is increased.

The fixed position of the arc provides for keeping the light in the center of a concave reflector. Where this is not required, the lamp may be simplified by leaving out the moving parts for the lower carbon holder, making it fixed instead of movable. The lamp thus devised has been employed by Herr von Krupp in portions of his great factory at Essen, in Germany, and the results have been so satisfactory that the light is being extended to other parts of the establishment.



KRUPP'S ELECTRIC LAMP.

Oil Wells and their Products.

Recent statistics show that there are now 10,882 wells producing oil in the State of Pennsylvania, and they pour out altogether about 50,000 barrels of oil daily. The product this spring has been 25 per cent greater than last year and about three times as great as the yield three years ago. One thousand eight hundred and eleven new wells were opened during the past year, and there appears to be no danger of exhaustion of the supply. This vast product adds immensely to the country's industries, and the transportation of it affords large revenues to the carriers.

Infusion of Horsechestnut in Rheumatism.

Dr. W. S. Drake reports in the St. Louis *Medical and Surgical Journal* that he had an inveterate case of chronic rheumatism cured by the patient bathing in an infusion of horsechestnut. This patient had not walked for nearly two years, and had gone through the whole list of rheumatic remedies. While treating a horse with the infusion of horsechestnut he found the swelling to rapidly disappear from his hands. He then applied the remedy to other joints, and received the same benefit. This is certainly an improvement on the practice of carrying a horsechestnut in one's pocket as a prophylactic of the same complaint.

Ancient Memphis.

A traveler in the East gives the following interesting account of his visit to the remains of ancient Memphis, founded by the first known Egyptian king—Menes. "But what did we see of this wonderful city? Only a succession of mounds," says the writer; "a few pieces of ancient statues; and far down below the present level, with its face in the water, a magnificent figure of a woman in Egyptian dress, with noble features and finely-modeled form, almost perfect, although probably 4,000 years old. As a matter of course, we lingered and looked as long as we thought sentiment required, then pushed on to the remarkable ruins of the cemetery, which was connected with this city, or I should say, magnificent city of the dead—to the very confines of which Memphis extended. It is now but a little more than a vast mountain of sand, being just on the precincts of the African desert. There are so many tombs everywhere peeping out, and so large a number of pyramids—eighty-one in all, scattered about—that the interest is keenly excited at once; and at every step some new developments take place. When we remember that old Memphis was seventeen miles in circuit, and was occupied with villas, gardens, and sacred groves, we can realize more than in any other way the wondrousness of the scene which remains to us to-day. After passing the largest pyramid, considered the oldest monument of antiquity in the world, we descended rapidly to the one little house of refuge standing in the midst of the sand, dismounted and lunched—thus securing a good resting season, and after about an hour, started out with our guides to the two special points of interest here, the Mausoleum of the Sacred Bull, and the tomb of the Priest Tih, the latter built about 3050 B. C. These were uncovered in 1860 by the Egyptian authorities, who, first noticing mounds in the sand bearing the appearance of heads, appointed a commission, and, after a labor of sixteen months, an avenue of sphinxes, 600 feet long, was laid open, the pedestals or statues being perfect in all cases. This was paved and led to the Mausoleum of the Sacred Bull, where these objects of worship had been entombed for several dynasties. There were found three separate chambers of temples, the latest where dates were found—650 B.C.—being the only one now open. One cannot help feeling an interest in every detail of such a place. There are the long avenues, broad and high, hewn in the solid rock, while all along the sides are deep recesses where are now standing the sarcophagi of the bulls. Twenty-five perfect ones stand in one archive, each weighing forty tons, and many of them fully engraved with figures, representing life, death, and immortality. But it is no more wonderful to see them where they are than to understand how they were put there. One which was presented to the French had been abandoned when moved some little distance, as too heavy to be taken away. They are thirteen feet long, eleven feet high, and seven feet deep, and, although many of the covers have been removed, nothing was found in any of them. Above the sarcophagi are inscriptions relating to their burial, and in whose reign they died. Many tablets were found upon the walls, which were placed there as offerings to the god; these, however, were all allowed to be taken to Paris."

A Tribute to Cyrus H. McCormick.

The Academy of Sciences of the French Institute have elected Mr. Cyrus H. McCormick as correspondent of the Academy in the Department of Rural Economy. This is a recognition of his services in the invention and manufacture of harvesting machinery, and his official connection with the recent Exhibition at Paris.

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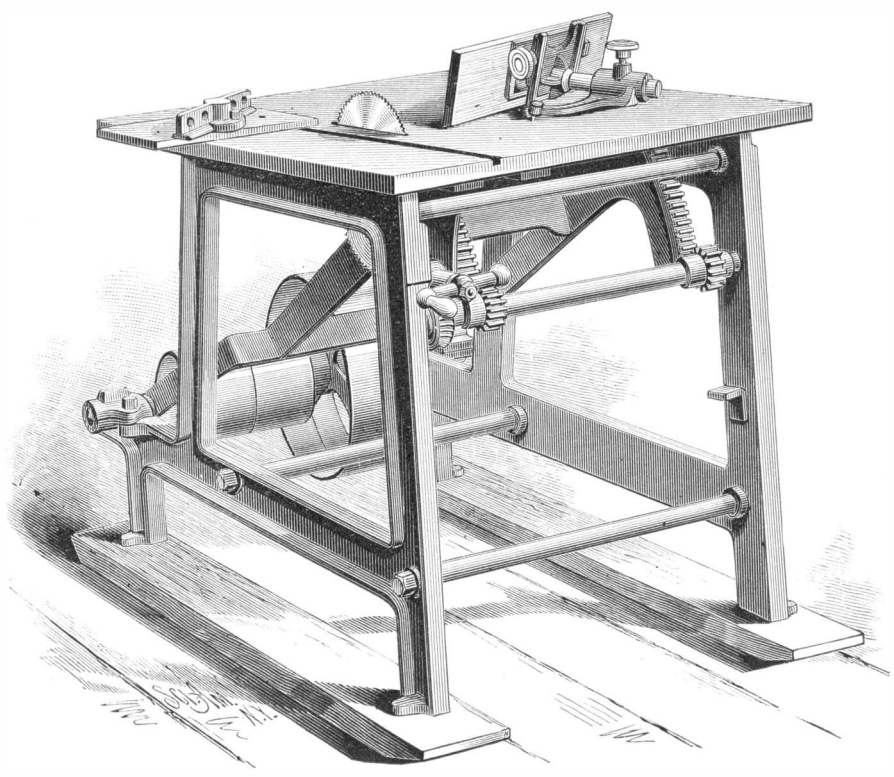
NEW SHOP SAW

The machine represented by the annexed engraving is an improved shop saw which combines all the necessary adjustments for cutting right and left hand angles and slitting at any bevel. The gauges for these purposes are light, simple, and easily handled. The saw mandrel is of steel, 25 inches in length, has long bearings, is hung in a swinging frame—hinged on the counter shaft—giving a uniform and good length belt.

The swinging frame is raised and lowered, by a worm working into a worm pinion, on a shaft carrying two gears that mesh into both sides of the upper end of the swinging frame, thereby securing accurate and positive movement of the saw up and down. The top is hinged at the rear end and may be raised to a perpendicular position. It has a loose throat piece that may be removed for the admission of different sized saws, dadoes, or other tools. The mandrel is fitted at the end opposite the saw to receive a boring bit, and the frame is calculated to receive a boring table. All the adjustment necessary is provided in the arrangement for lowering and raising the saw. A good boring machine is, in this manner, provided at a very slight cost; in fact, the purchaser can bolt a plank on the side of the frame and provide himself a boring table without additional cost.

This saw is very simple, convenient, and strong without being bulky. It is plain but substantial, and withal it has all the conveniences required in a shop saw at a very reasonable cost. It is manufactured only by the Battle Creek Machinery Company, of Battle Creek, Mich., whose reputation for good work is a guarantee of excellence.



PRESTON'S DIMENSION SAW.

Telephone in Church.

A telephone has been placed in the Congregational church at Mansfield, Ohio, the wires leading to the houses of several aged and invalid persons. A contemporary in describing it says it surmounts a floral decoration on the table in front of the open platform, where it is hardly seen. The speaker pays no attention whatever to it, yet every word uttered in the auditorium is easily heard in the rooms of the dwellings which the wires reach. The first message from the minister was from Scripture: "The word is nigh unto thee;" "His word runneth very swiftly."

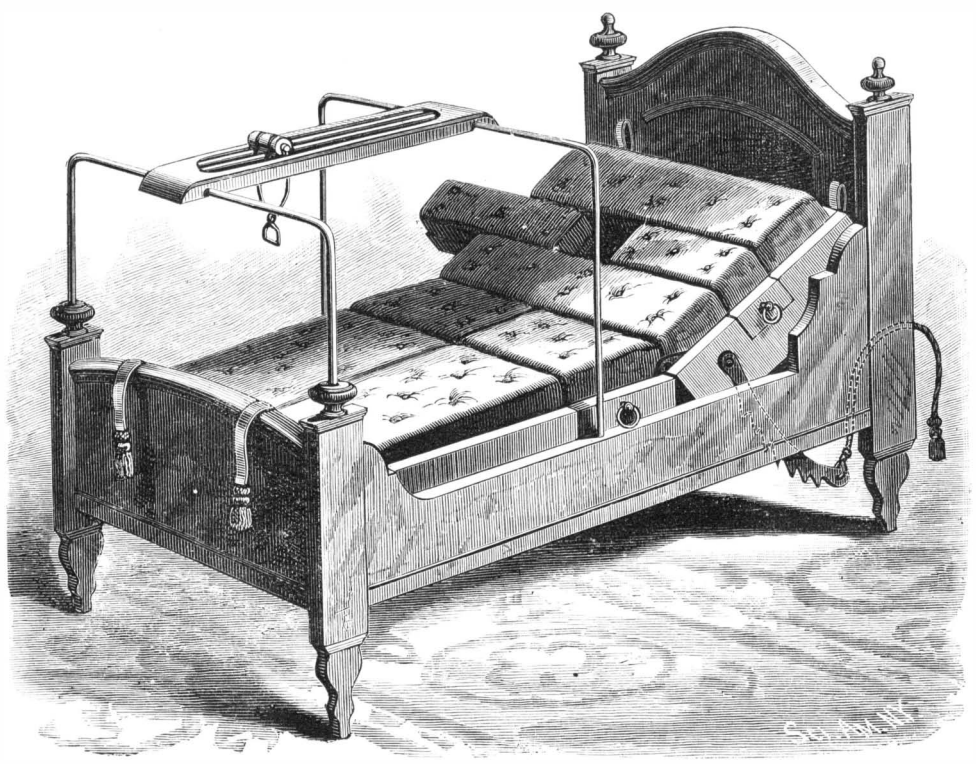
A NEW INVALID BED.

The invalid bed shown in the engraving is the invention of Mr. Wm. S. Groff, of Frederick, Md. It is intended for hospitals and private families, and has been very highly recommended by eminent physicians and persons who have used it. It seems especially adapted to cases of paralysis, fractures of the lower limbs, and to persons who are obliged to keep a recumbent position.

It will be seen by reference to the engraving that the bed bottom is made in several sections. The head section may be raised or lowered, and it is held in any desired position by the curved ratchet bar, which engages a pin projecting from the inner side of the bed rail. The middle part of the head section is made in two pieces, which may be drawn out laterally to admit of ventilation and also to afford a means of treating bed sores. The middle section of the bed is made in two parts, which are removable to admit of the use of an adjustable bed pan without changing the position of the patient. The foot section of the bed is divided longitudinally to give a separate support for each leg, and it may be raised or lowered at pleasure, being held in position by folding legs.

Above the foot section a bar is supported by two bent rods, and is itself provided with a track or ways for the rollers that support a stirrup intended to receive a strap for supporting one or both of the legs.

The inventor also provides a pulley to be attached to the footboard of the bed to suspend the leg by means of a cord and counterweight The pulley has a locking device for retaining the leg in any desired position. A table, not shown in the engraving, is attached to the bed for supporting food, dishes, etc., and for holding books, papers, and writing materials. This table is adjustable, and may be readily attached to the bed or removed. The bed is arranged for the comfort of the patient and for the convenience of the attendant or nurse. Its advantages will be readily admitted by those who have occasion to use an article of this character.



GROFF'S INVALID BED.

Volcanic Eruptions.

In seeking an explanation of the phenomena which Herr Siemens witnessed during a visit to Vesuvius in 1878, the author has been led to some general studies in vulcanology, which have far more than local interest. At the time of his visit, says a writer in the *Nineteenth Century*, steam, or other vapor, was being ejected in explosive puffs from the cone in the center of the great crater. Assuming that steam or gas may be suddenly generated at great depths, it might fairly be expected that its ejection would be accompanied by the outflow of much lava, and that after each explosion sufficient time must be given for the accumulation of fresh lava in the chimney of the volcano before the next expulsion could occur. It may be suggested, indeed, that as water at a very high temperature is dissociated into its components, the magma or molten rock beneath the volcano might contain an explosive mixture of oxygen and hydrogen gases; then on any considerable diminution of pressure these gases would recombine and again form water. It is, however, highly improbable that, under the enormous pressure to which the magma must be subjected, anything like dissociation should occur; for the author's own experiments have shown that a mixture of oxygen and hydrogen, when subjected to a very high pressure, will explode. Dismissing, then, the idea of dissociation, the author is driven to the conclusion that hydrogen gas, or it may be combustible compounds of hydrogen, rise from below, and, mingling with atmospheric oxygen, form an explosive mixture which is burned in the upper part of the volcanic chimney. From the large quantity of steam generated by the explosions, it is probable that hydrogen is the principal combustible constituent of the gases, but it is not easy to decide whether the hydrogen exists in a free state, or combined with sulphur, carbon, and other elements.

Prevention Better than Cure.

The following extract is from an address by the venerable Dr. Samuel D. Gross, recently delivered at the dedication services at the unveiling of the McDowell monument, in Danville, Ky. These words have a practical ring, and were addressed to the young men of the Kentucky Medical Society, who were present in large numbers:

The great question of the day is, not this operation or that—not ovariotomy, or lithotomy, or a hip joint amputation, which has reflected so much glory upon Kentucky medicine—but preventive medicine, the hygiene of our persons, our dwellings, our streets—in a word, our surroundings, whatever and wherever they may be, whether in city, town, hamlet, or country, and the establishment of efficient town and State boards of health, through whose agency we shall be the better able to prevent the origin and fatal effects of what are known as the zymotic diseases, which carry so much woe and sorrow into our families, and often sweep like a hurricane over the earth, destroying millions of human lives in an incredibly short time. The day has arrived when the people must be roused to a deeper and more earnest sense of the people's welfare, and suitable measures adopted for the protection as well as for the better development of their physical, moral, and intellectual powers. This is the great problem of the day, the question which you, as representatives of the rising generation of physicians, should urge, in season and out of season, upon the attention of your fellow citizens—the question which, above and beyond all others, should engage your most serious thoughts, and elicit your most earnest co-operation.

Collodio-Bromide with Gum Guaiacum.

In a note in a recent number of the official journal of the Photographic Society of Great Britain Captain Abney says: "The members of the Society are invited to try a modification of the ordinary washed emulsion process, as it is believed that it is valuable in more ways than one. The modification consists in adding to the washed emulsion one sixth part of alcohol which has been saturated with gum guaiacum. The plate is coated in the ordinary manner, and the film takes a greenish-blue tint when dry. The drying may be done 'spontaneously,' or it may be accelerated by the warmth of a drying room or box; but the temperature should not exceed 120°, since the gum then fuses and the film repels the developer. Those plague spots that refuse to develop have not been found to be present except in one or two plates, and the fact of their presence has been recognized before placing them in the dark slides, since they remain of the ordinary color of the bromide while the surrounding portions are colored, as stated above. It is something to be able to see the spots before development, and on this account alone the addition of this gum is valuable.

To develop, the plate is flooded with alcohol, and then washed and treated with the alkaline or ferrous oxalate developer in the usual manner. The film, being very porous through the removal of the gum, readily takes any amount of density, and it is amenable to intensification with pyrogallic acid and silver nitrate. If a phantom image be developed first by a weak developer it may be built up as the operator may choose. The film has no tendency whatever to leave the plate; even the most horny film becomes glued to the surface, and, as before stated, easily permeable to the developing solutions. The gum acts as a preservative, as will be seen by the simple experiment of dissolving it in alcohol and pouring the solution over a clean plate. On evaporation of the alcohol a hard, transparent film is left.

The keeping qualities of these plates between exposure and development have yet to be tested. If they keep as well after exposure as they do before they will be very useful plates for the tourist. The writer appeals to photographers to try the process, in the hope that it may lead by experiment to the introduction of a really good preservative which may be applied to the plate with the emulsion itself.

"Gum ammoniacum has been already used by Mr. Stillman, but its comparative insolubility is a great drawback to its use as a preservative. Gum guaiacum combines with bromide; hence it is efficient on this score."

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AMATEUR MECHANICS.

EASILY MADE SLIDE REST.

While the most of the work to be done on the foot lathe may be accomplished as expeditiously and quite as well without a slide rest as with it, yet there are some operations that are greatly facilitated by means of this tool. Boring, for example, a very difficult thing to do with hand tools, may be done quickly and accurately by using a slide rest. In gear cutting—which will be described in a subsequent article—a slide rest is essential.

In the case of this tool, as well as others previously described, the purchase of a well made article is recommended. Yet, if one has time and feels so inclined, he may make a really efficient slide rest with no other tools than his lathe and ordinary turning tools. Figs. 1 to 3 inclusive represent a slide rest that may be made in this way, Fig. 1 being a perspective view, and Figs. 2 and 3 respectively longitudinal and transverse sections of the tool carriage.

The T-shaped casting, A, has a longitudinal slot, which is made T-shaped in cross section to receive the head of the bolt that confines it in position upon the plate fitted to the lathe bed. The vertical ears at opposite ends of the casting are bored to receive the ends of the rods, B, upon which the tool carriage, C, slides.

The first operation in making the slide rest is to make one side of the casting, C, perfectly plane. It is then chucked in the lathe with the plane side next the face plate. Three holes are bored through it, two for the rods, B, and a smaller one for the screw, G. It is then chucked on an angle plate, so that the holes for the rods, B, are equally distant from the center line of the lathe, and the hole for the rod, D, is bored very carefully to insure the parallelism of its sides. The casting, A, is now placed upon a plane surface, and the casting, C, is clamped to the ear at one of its ends, and adjusted so that a line drawn through the center of the holes is exactly parallel with the bottom of the casting. The casting, C, is used in this manner as a template for drilling both of the ears for the reception of the rods, B. It will be necessary to exercise great care in drilling these holes, as it is of vital importance to have the rods, B, perfectly parallel.

The casting, C, may now be tapped to receive the screw, G, and the tool carrying bar, D, may be fitted to its place, and turned down and threaded to receive the internally threaded boss of the wheel, E. This boss is fitted to the base of the casting, C, and is grooved circumferentially to receive a split ring, F, the latter being drilled to receive the ends of three screws that project through the casting into it and prevent the boss of the wheel, E, from moving lengthwise of the hole, while the arrangement permits of the free rotation of the wheel. The bar, D, has a head which is drilled vertically to receive the tool post, and is provided with a heavy feather at the top, which is received by the slot formed by sawing into the upper portion of the casting, C. To render the bearing of the bar, D, somewhat adjustable, two screws pass through the casting above the feather. The tool post is of the usual description, having a loose collar above the head of the bar, D, and a nut below it. The mortise for receiving the tool extends a little below the loose collar, so that when the tool is clamped the post and ring will also be clamped. A slot is cut through the bottom of the casting, C, into each of the guide rod holes to permit of adjustment in case of wear by means of the screws which pass transversely through the slot. The ends of the rods, B, are fastened by a similar device. The screw, G, is prevented from end motion by a shoulder on the outside of the ear at the crank end, and a collar on the inside. The rods, B and D, may be made of steel or of cold rolled iron; the latter will be true enough without turning. The casting may be either of brass or iron; a good quality of iron will perhaps prove the most satisfactory. The slots may be cut with the saws described in a former article. The tools to be used with the slide rest have also been previously described.

In Fig. 4 is represented a boring device which will be readily understood without special description. The casting, A, is fitted to the tool rest socket and provided with a sliding bar, B, which is like the bar, D, in the slide rest above described, excepting that its back end is rounded and provided with a pin which slides in the slotted arm attached to the tail spindle of the lathe by which it is moved, instead of having a moving device of its own. With this tool, boring and some kinds of outside turning may be done. It is less expensive than the slide rest and answers a good purpose.

M.

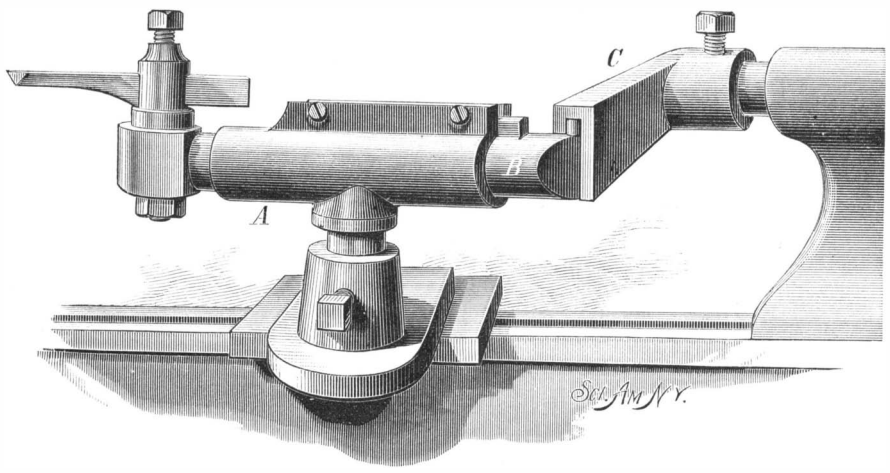
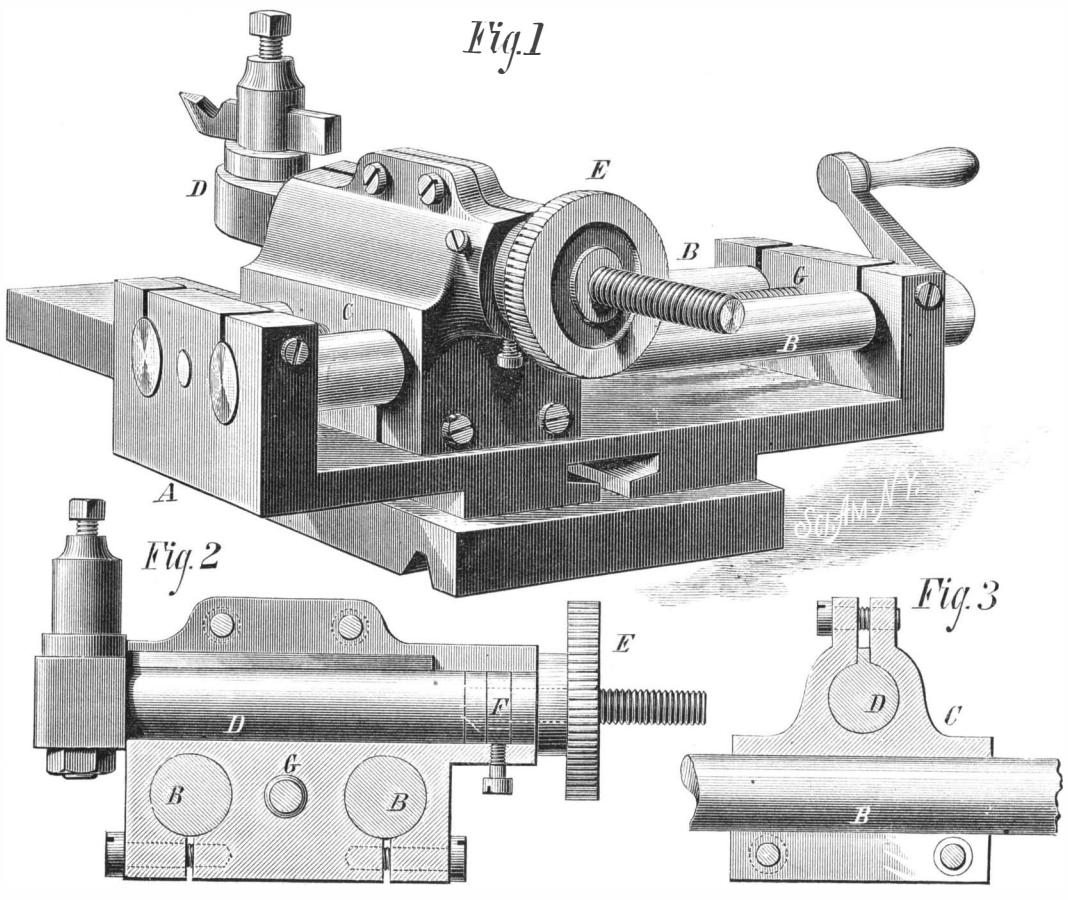


Fig. 4.—BORING ATTACHMENT.



EASILY MADE SLIDE REST.

A Paraffin from a Pine.

At a meeting of the London Chemical Society in April, a paper was read by Mr. T. E. Thorpe on "Heptane from *Pinus sabiana*." The author remarked that in the *Pharmaceutical Journal* of March 30,1872, Mr. W. Wenzell described, under the name of "abietene," a new hydrocarbon obtained by distilling the exudation of the *Pinus sabiana*, a tree indigenous to California, and known locally as the "nut pine" or "digger pine." To procure the exudation, the tree, during winter, is notched and guttered at a convenient height from the ground. The resin on distillation yields a liquid hydrocarbon. The crude oil is met with in San Francisco as an article of commerce, under the names of "abietene," "erasine," etc., as a substitute for benzoline in removing grease spots, etc. It is a nearly colorless mobile liquid of a powerful aromatic smell, resembling that of oil of oranges.

Wenzell contrasts its character with those of terebene from *Pinus sylvestris*. Abietene has a specific gravity of 0·694, boils at 101°, dissolves but a small quantity of hydrochloric acid gas, and is but little attacked by cold nitric acid. From a consideration of the general properties and behavior of this hydrocarbon, the author of the present paper (Mr. Thorpe) concluded that it was likely to be a paraffin. The occurrence of a paraffine playing the part of oil of turpentine in the vegetable kingdom was a thing hitherto unheard of, the only natural sources of this hydrocarbon (heptane) being petroleum and fish oil. The author therefore obtained from Mr. Wenzell two gallons of the abietene, and subjected it to a most exhaustive chemical and physical examination, the details of which are given in the paper. The crude oil is slightly contaminated with a resinoid matter to which its smell is due. The pure oil has the composition of heptane, containing 83·85 per cent carbon and 16·03 per cent hydrogen. The author has compared the heptane obtained from *P. sabiana* with the heptane from petroleum, and that obtained by treating azelaic acid with baryta. The specific gravity of the heptane from petroleum is ·7301, that from azelaic acid is ·700. These heptanes are believed by Schorlemmer to be identical. The author is at present engaged in an investigation of this point. It is very remarkable that a paraffin should be found in such a state of purity in a plant.

MISCELLANEOUS INVENTIONS.

Mr. A. P. Peabody, of Holden, Mo., has patented an improved animal trap for catching rats, mice, and other small animals. It is automatic in its operation and very simple in its construction.

An improved instrument for cleaning combs after they have been used for combing the hair, has been patented by Mr. Samuel E. Hibbert, of Lowell, Mass. It consists of a spindle united to two disks, between which are stretched twisted or crimped wires.

Mr. Thomas Cunningham, of Nashville, Tenn., has patented an improved mail bag fastener, which consists in a fork to which the rope is attached after being reeved through the mouth of the bag so as to have a looped end, which, when the bag is to be closed, is drawn tightly and doubled over the fork, so as to be held firmly in place.

An improved farm gate has been patented by Mr. L. C. Pope, of Paola, Kansas. This gate is constructed so that it may be conveniently opened and closed by a person on horseback or in a vehicle. The gates are supported by rollers which run upon rocking rails.

An improved fire-wood drag saw has been patented by Messrs. T. B. Fagan and M. W. Henry, of Van Wert, O. The invention relates to a frame and the manner of hanging the saw therein, so that the sawing is done more rapidly and with less exertion than with the ordinary hand saw.

Mr. L. O. Winans, of Newburg, N. Y., has patented an improved plaiting machine, which consists of a rectangular frame or box made of a single piece of tin, having in the top parallel slots, and having the edges at the slots bent downward so as to form a lip under each slot. The plaits are formed by forcing the goods down through the slots with a flat blade.

Mr. Enoch Lord, of Portland, Me., has patented an improvement in reclining chairs, which consists in bent and pivoted bars, and catch bars pivoted to the back and arranged so that a person sitting in the chair can raise both catches with one hand and adjust the chair back at any desired angle.

Messrs. Alfred E. and William E. Feroe, of Madalin, N. Y., have patented an improvement in processes and apparatus for fining fermented liquors. In this process the yeast is separated from the ale and lager beer in a very short time, and the flavor and the appearance of the liquors are improved.

Messrs. Alanson Cary, of New York city, and T. S. Blair, of Pittsburg, Pa., have patented an improved metallic fence post, the design of which is to arrange the materials of which it is composed so that pressure against the post will always be opposed by the tensile strength of the materials, thus making the post very light but strong.

An improvement in milk coolers, patented by Mr. John White, of Lisbon, N. Y., cools the milk by a current of water and retains it at a proper temperature. It consists in a double vessel having hinged double leaves or covers through which the water circulates.

An improvement in wrenches for making screw connections between pipes, couplings, etc., has been patented by Messrs. J. G. and O. G. Johnson, of Girardville, Pa. The wrench jaws are pivoted to the handle, and they are held together by straps.

A tap, consisting of a grooved tapered body, threaded through a portion of its length, and provided with an internally threaded ring, for confining cutters in the grooves, has been patented by Messrs. L. D. Castle and J. W. Strong, of Bridgeport, Conn.

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RECENT MECHANICAL INVENTIONS.

A machine for felting or hardening hat bodies, in which the opposite working faces of the apron and felting roll are provided with rope ribs, has been patented by Mr. J. G. Hecker, of Danbury, Conn.

An improved fastener for window shutters and blinds, which will fasten itself when the blind is swung open, and may be readily unfastened without reaching out of the window, has been patented by Mr. N. P. F. Rosenberg, of New York city.

An improved rolling shade for greenhouses, consisting of a number of slats hinged together, and placed on the outside of the greenhouse roof, so that it may be readily rolled up or let down over the glass by means of mechanism inside the house, has been patented by Mr. Leon Lefébure, of New York city.

Mr. Jonathan Leffler, of Meyerstown, Pa., has patented a nut for securing the bolts of railroad rails or parts of machinery, which, when applied, is locked and prevented from turning backward. It is also capable of tightening itself, so as to take up shrinkage and prevent rattling.

Mr. William T. Doremus, of New York city, has patented an improvement in the oscillating chair for which letters patent No. 161,671 were granted to him April 6, 1875. In the improved form the degree of elasticity of the rubber springs may be readily regulated, so that the tilt of the chair may be adjusted.

An improved clutch, intended for use in connection with the rim of a pulley, hoisting drum, or coupling device, has been patented by Mr. Patrick Fleming, of Fair Haven, Conn. It consists in a hub fitted with radial arms, which are thrown in and out by a wedge-acting sleeve connected with the hub.

An improvement in the class of churns whose box or body is suspended by rods or chains, so that it may be oscillated, has been patented by Mr. Joel T. Hart, of Greenwood, Mo. The improvement consists in the combination of a treadle lever with the suspended churn box.

An improved percussion trap for throwing glass balls has been patented by Mr. Wm. H. Plumb, of Paterson, N. J. In this device a ball-supporting cap is attached to the end of a piston rod, which is thrown up by the successive discharges of cartridges in a revolving cylinder.

Mr. Pardon C. McCune, of Mount Etna, Iowa, has devised an improvement in horse powers which consists in applying a balance wheel to the shaft from which the power is taken, and driving the same by means of cranks and connecting rods from the master wheel of the horse power.

An improved carpet stretcher, actuated by a spring and lever, has been patented by Mr. L. A. Winn, of Carthage, N. Y. This invention consists simply of a bow spring, lever, and link, the spring having at one end a claw for engaging the carpet, and at the other a toe, which is inserted under the edge of the base board.

An improvement in locomotive smoke stacks, consisting in an arrangement of spark and cinder deflectors and a shield for preventing the back draught from exhaust steam and currents of air, has been patented by Mr. John R. Fish, of Grand Rapids, Mich. It is intended to prevent the ejection of sparks and cinders and deliver them back to the stack.

A steam valve, constructed so that the old and worn out seat may be removed and replaced without breaking the pipe joint, has been patented by Mr. Charles A. Bevans, of New Haven, Conn. After unscrewing the guide of the valve stem and removing a nut that retains the valve seat, the latter may be readily withdrawn.

Artificial Ice.

The Boston *Journal of Chemistry* believes that one of the remarkable triumphs of science and art as developed in this progressive age is seen in the devices for producing artificial ice in large quantities. It is claimed, and not without reason, that, so perfect has the apparatus become, ice can be formed on the shores of any of our northern lakes and rivers at less cost than that necessary to the cutting and storing of natural ice in winter. One of these interesting devices in operation on the shore of the St. John's River, Florida, last winter, afforded the writer ample facilities for observing its work from day to day, and testing its capabilities. It was of the class in which ammonia is the agent employed to produce refrigeration, and well known as the arctic machine. It was found capable of "turning out" ten tons of ice daily, in the form of blocks about two and a half feet long and ten inches in thickness. The congelation was perfect, and the product met with a ready sale at the hotels and private residences, not only in Jacksonville, but at all the points on the St. John's River. The price of Nothern ice in Florida previous to the introduction of the machine was from ten to fifteen dollars a ton in moderate quantities; the artificial ice is sold at five dollars, and thus a powerful and successful competitor to the ice companies sprang up at the door of their depositories. The dealers resisted and ridiculed the "machine" for a considerable time, but in the end it triumphed, and prices were reduced. The actual cost of manufacturing ice in Florida is not far from seventy cents a ton, and this includes the storing and delivery. It must be known, however, that fuel in Florida costs almost nothing. The ice company have only to haul the waste lumber from a steam sawmill, fifty rods away, to be used as fuel, and it is supplied gratuitously.

The principle upon which the machine acts is the same as that which every housekeeper adopts in freezing creams in summer. When solids are changed to liquids, a large amount of heat is absorbed, and surrounding objects must supply it; if the liquid is volatilized, or changed to a gaseous body, still larger supplies of heat are demanded. Thus, if caustic ammonia, which in its natural condition is a gaseous or aeriform body, is subjected to powerful pressure it changes to a liquid, and in doing so is forced to give up a large amount of latent heat. If it is relieved of pressure it again becomes aeriform, and as it demands a large amount of heat it seizes it from all bodies in contact. If water is in contact it is robbed of its latent heat and becomes frozen, and thus ice is formed.

In the arctic machine about fifty pounds of liquid ammonia are stored in a very strong iron cylinder, and this is connected with a coil of pipes immersed in a tank of strong brine; into this brine galvanized iron cans holding pure water are placed, and these cans are of the size of the blocks of ice which are formed. The liquid ammonia is allowed to flow through these coils, and it gradually becomes gaseous, and in becoming so abstracts from the water so much heat that it speedily freezes. A powerful steam pump forces the gaseous ammonia back into the iron cylinder again, thus liberating great heat, which is disposed of by cold water dropping upon coils of pipes through which the ammonia passes on its way to the condenser. The process is a continuous one, and if the pumps and coils do not leak there is no loss, and the operation may go on so long as the machinery lasts. The apparatus and the scientific principles upon which it acts are very interesting, and we are convinced that at present there is no hindrance to securing abundant supplies of ice, at cheap cost, in any tropical country where fuel is abundant and of low cost.

Iron Industries of Leeds.

The machine trade of Leeds is at the present moment, like most other English industries, in a state of depression. The productive power of the various foundries and machine shops, however, is greater than ever; and when the tide of prosperity turns once more in their favor, the canopy of smoke will settle with all its old density over the woolen metropolis, and the furnaces will blaze, and the hammers and anvils will clang, with all their ancient force. It is marvelous to observe to what a position the iron industries of Leeds have risen in such a short space of time, yielding large and rapid fortunes to the leading men engaged in them, and almost elbowing the staple trade of the town into a condition of secondary importance. It is one of the traditions of the district that iron works existed in Leeds and the neighborhood in the time of the Roman occupation, and the monks of Kirkstall are credited with having added iron working to their other pursuits; but it was not until the Murrays, the Fairbairns, the Kitsons, and other artificers in iron entered upon the scene that Leeds came properly under the rule of Vulcan. These men not only enriched themselves, but enriched the town, developing to the general profit of the community the valuable mineral resources of the district, and giving the world the advantage of their many mechanical discoveries. It was never dreamed at the beginning of the present century that such a possibility of development existed within the boundaries of Ralph Thoresby's native town. There were in 1871, 99 collieries existing in the Leeds district alone; the total number for Yorkshire being 423. In the same year there were in the Leeds and Bradford district 13 iron foundries, containing 247 puddling furnaces, and 59 rolling mills. The great industrial activity and immense resources which these figures represent are in wonderful contrast to the picture which could be drawn of the condition of things half a century ago; and whether England is destined to retain its industrial pre-eminence or not, the history of the men who were mainly instrumental in building up the nation's industrial greatness will always remain among the most attractive and most instructive evidences of a progress that is as yet probably the mightiest achievement of human effort.—*London Society.*

Country Schools.

A writer in *Barnes' Educational Monthly* discusses intelligently the importance of common schools and the difficulties encountered by teachers in inducing regular attendance and the maintaining of uniformity of text books. Another difficulty, complains the writer, arises from a mania among a certain class of farmers for acquiring all the land that joins theirs. Indeed it becomes a species of insanity, and from it men seldom recover. This is the way it works: So soon as a man, by scrimping and scraping, has saved a few hundred dollars, he bargains for the farm adjoining his, and makes the first payment, giving a mortgage for the balance. Now, for years he must scrimp and scrape even more closely, to pay off that mortgage. No sooner is this accomplished than the process is repeated; and so on, till death ends his work.

Meanwhile, his family is denied every comfort, his wife is a slave, and his children are growing up little better than heathens. Not that the father means to be unkind or neglectful, but he is "so poor"—land poor, always with a mortgage hanging over him, always with big interest and big taxes to pay. His home cannot have books and pictures, for these cost money, and he has none to spare; nor flowers, and the thousand dainty devices which make home attractive, because the overworked mother has no time nor heart for such things; and so the eternal grind, grind, grind, of their life goes on, without a particle of brightness to illumine it. . . .

Now for the effect upon our public schools. Such a man frequently becomes the heaviest tax payer in the district. Through the renters upon his various farms he often controls votes enough to turn the scale in the district election. Now, he has himself and a colleague like unto him elected directors. Do you need to be told what such a board will do? Poor school-houses—for why should he care more for the school-house than for his home?—no apparatus, short terms of school; the cheapest of cheap teachers—one who will work twenty-six days for a month, "same as farm hands"—become the rule. Or, if this man does not reach the dignity of school director, he still has a controlling influence in district affairs, and that influence is all in favor of a penny-wise, pound-foolish policy.

The effect upon his own children is no less disastrous. They do not attend school regularly, because they are kept out to work whenever a possible five cents can be made thereby. They are seldom supplied with necessary books, for these cost money, and the money must go to lift the mortgage. They have no enthusiasm for study, for the atmosphere of their home smothers it. And the great danger is that these children will grow up to curse the world with multiplied copies of their father.

American Products in England.

The *Agricultural Gazette*, published in London and devoted, as its title implies, to the farming interests of Great Britain, suggests that he would be a bold man who should venture to deny that American competition is the great nightmare of every English producer. Not merely in the abundant surplus of "prairies bounded by the setting sun," but also in many minor articles (to the perfection of which human skill and labor enters), the toe of America galls Britannia's heel.

English bacon curers, cheese dairymen, and butter makers have long been dolefully complaining that their ordinary make is driven out of the shops by importations from beyond the Atlantic. A London builder recently stirred half the Black Country to wrath by stating in the *Times* that his customers preferred American locks. One day it is the vision of fleets entering Liverpool with cargoes of fresh meat and live cattle, which drives a section of Englishmen half wild. The next, the Kentish fruit growers see with horror the demand for the finest Blenheim oranges and Ribston pippins encroached on by "Baldwins." While those most self-satisfied of all Britons (the breeders and turfites of Newmarket and Epsom) have just had a wholesome pill to swallow in witnessing the triumphs over the best English and French horses of Papoose and of Parole.

It is impossible that this well-nigh universal success of our closest rival can be accidental. There must be a reason—some motive, universal there, but less active here—which brings our cousin Jonathan in so often as a winner. Defeat should be healthful, if its causes be discreetly examined. It cannot be merely soil and climate which work this miracle. For, into some of the American triumphs soil and climate do not enter. Nor can it be always the extra burden of taxation here which turns the scale against us. Because, in several of the wins recorded, the labor (which is the most expensive factor in the production) costs more there than the same would cost here.

It is not of the least use, as British farmers unwisely prefer to do, grumbling at the Legislature for not doing something in this case to redress the balance and to bring back good times. It is quite plain that some at least of the causes of our defeat are, to no small extent, inherent in ourselves; in our ways of conceiving and of carrying out our work.

The American thinks nothing too small not to be worth looking into, and the ingenuity and thoroughness with which every secret of nature is probed and is recorded are beyond all praise. We, on the contrary, are so satisfied that the methods we inherit are not only the best now, but the best ever to be discovered, that we do not care to do more than to inquire "what is the old way." Indeed not a few farmers resent as an insult the suggestion that they have anything to learn. To follow a precedent is the Englishman's one idea. Yet, as the problem offered to farmers is continually changing (for new items have constantly to be taken into account, and as relative values are continually being altered) the way to solve this problem successfully is by no means to go on copying the old figures. If cheese and butter are to pay the maker, they must now be the best of their kind, because, whatever may have been the case once, customers now have a choice, and they choose the best: having once had the best they will not take inferior. If cattle are to pay the vendor, these, too, must be of the best. And it is only common sense to say there ought not to be so many middlemen to claim a share out of the final price.

Shad in Arkansas.

Seven years ago a lot of little shad were placed in the Ouachita river, which rises in Arkansas, flows into Louisiana, and empties into the Red river in the latter State. Nothing was seen of them for a long while, and most people had forgotten the experiment, when two years ago two or three stray shad, the first that had ever been known in that region, were caught. Last year between thirty and forty were taken, and this spring they have been caught in immense quantities in Arkansas, in the vicinity of Hot Springs. This shows that there is no reason why the fish should not be domesticated in the far South, and the New Orleans papers call upon the people along the rivers in that region to stock them with young shad.

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The Treatment of Neuralgia.

Aconite is an old remedy in neuralgia, which has, however, not altogether realized the expectations which were formed of its value. The power which it often lacks has been lately claimed for its alkaloid by Professor Gubler, who announced that aconitia is almost infallible in trigeminal neuralgia. This substance was long banished from the materia medica for internal use, but it has been employed occasionally since the discovery of a crystallized form by Gréhaul and Duquesnel in 1871. Its value in neuralgia has lately been investigated by the New York Committee on Neurotics, of which Dr. E. C. Seguin is the chairman. The dose of all forms of aconitia is about the same, the initial dose being about half a milligramme ($\frac{1}{110}$ grain) twice or thrice a day. Gubler states that the dose of amorphous aconitia may be gradually raised to half a centigramme, but Duquesnel's preparation has to be given with greater caution. There are, however, differences in susceptibility, and some persons cannot bear a larger dose than $\frac{1}{200}$ of a grain; while one case was met with in which $\frac{1}{64}$ of a grain every three hours was tolerated.

From a trial of the treatment in a series of cases, the committee conclude that, on the average, distinct physiological and therapeutical effects may be obtained by giving $\frac{1}{100}$ of a grain three times a day. Of six cases of severe trigeminal neuralgia, one, probably a reflex neuralgia from a decayed tooth, was not at all benefited. Three cases of epileptiform neuralgia were slightly or only temporarily relieved. Two cases were cured. One of these had existed for seven years, with an interruption of seven months, procured by resection of the affected nerve. The results thus afford a partial support to M. Gubler's assertion.

The value of ammoniacal sulphate of copper in the treatment of the same affection has been asserted by M. Féréol in a recent communication to the Académie de Médecine. He states that in cases in which every treatment has failed, even the administration of gelseminum and of aconitia, a cure or remarkable relief may be obtained to the most severe symptoms by this drug. Among the examples he gave of its use was the following: Trifacial neuralgia of two months' duration, with absolute (?) insomnia, was unrelieved by the extraction of teeth, quinine, bromide, aconitia, or tincture of gelseminum, hypodermic injections of morphia, or arsenic. From the first day of the administration of the ammonia sulphate of copper there was a notable remission in the symptoms and cessation of the insomnia. In one case the dose was pushed to eight grains without any other accident than nausea. It has the drawback of occasioning a persistent metallic taste in the mouth. Only one case of intolerance was met with; in that a grain and a half of sulphate of copper occasioned violent vomiting.—*Lancet.*

Chinese Physicians.

According to the *National Medical Review*, when the Chinese physician examines the pulse, he places the arm of his patient on a cushion; then he applies the index, the middle and ring fingers on the anterior face of the wrist in such a way that the index finger may be nearest the arm, and the ring finger nearest the hand. The physician then elevates and depresses each finger, alternately, with more or less force, like one playing on an organ. They examine, also, during a limited number of respirations, each of the nine pulses, which are formed, according to their doctrine, on each hand, and they deduce from these their prognosis, at once, without hesitation; make their prescriptions, and attend to administering their medicines on the spot; receive the fee and retire, not to return unless again summoned.

The Chinese physicians imagine a multitude of odd connections between the viscera of the human body and the elements, the seasons of the year, the stars, colors, etc. The heart, they say, is analogous to fire, to the planet Mars, to summer, to spring, and to southern climes. It comes from the liver, begets the spleen and the stomach, is antipathic with the kidney, and receives no injurious influence from its contact with the lungs.

During the springtime the pulse is like a tense cord; in summer it is more developed and becomes exuberant; in autumn it appears as if floating; in winter it is rather quiet.

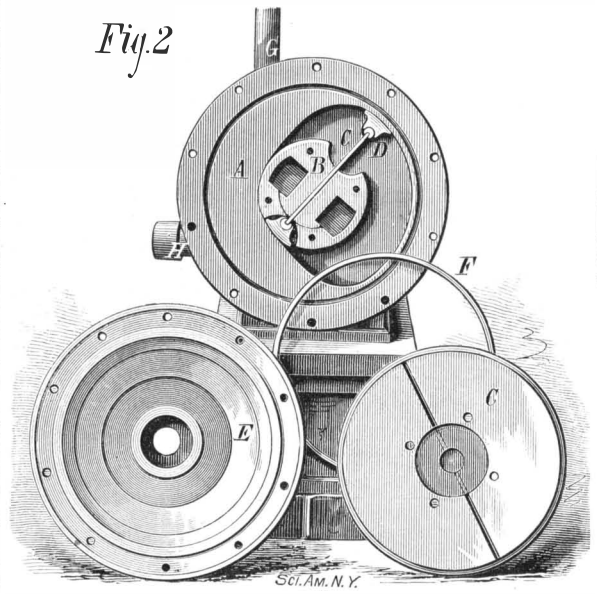
They think that the spirits and the blood, both vehicles of heat and humidity, run through all parts of the body in twenty-four hours. This daily circulation, they say, commences in the lungs at 3 o'clock in the morning, and ceases next day at the same place and at the same instant. The knowledge of the canals through which this is effected constitutes, in the eyes of Chinese physicians, the fullness of anatomical knowledge.

They count six canals which pass directly from above downward, and an equal number which return from below upward; eight canals run transversely, and fifteen obliquely.

A NEW ROTARY ENGINE.

The construction of rotary steam engines has received the attention of many of the best engineers and mechanics, with results that have usually proved anything but satisfactory. However, it is claimed by the manufacturers of the engine shown in the accompanying engraving that, after having several of them in use at their own factory and in various other places, they are satisfied that it is practical and that it must for many uses supersede the reciprocating engines.

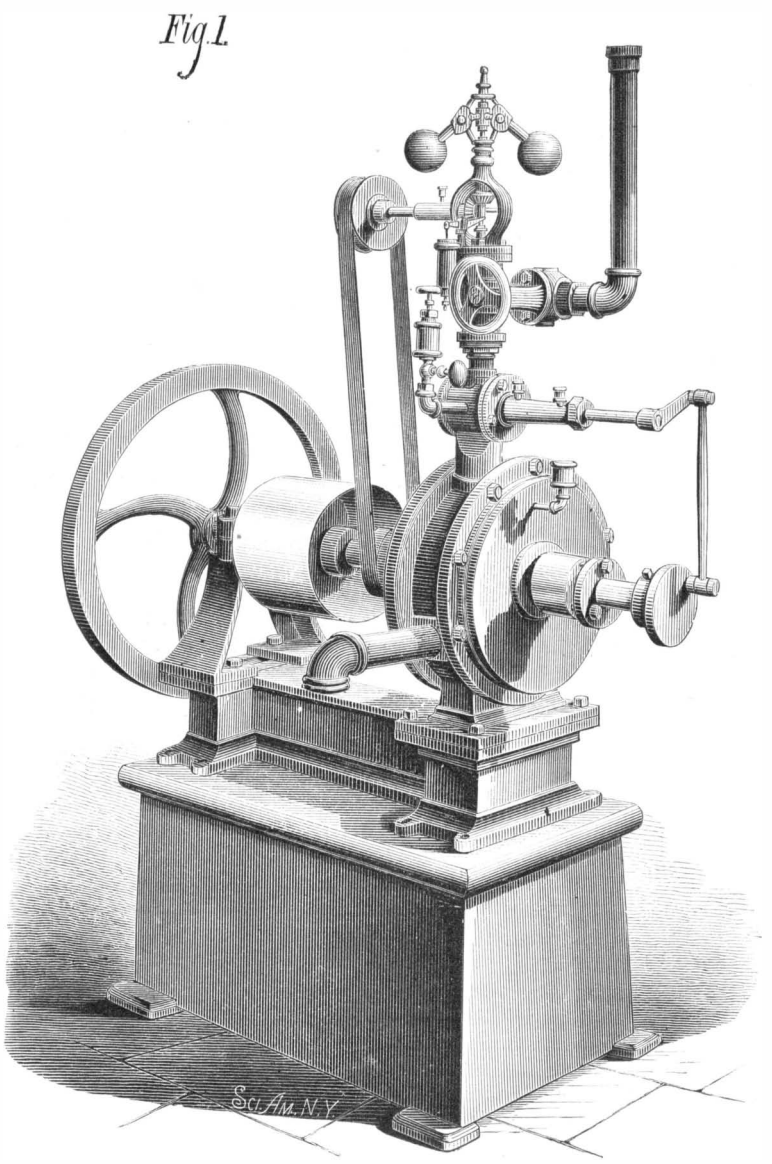
The case, A, contains cams and abutments, and the cylinder, B, has attached to it the heads, C C, which rotate with



ROTARY ENGINE.

it when the engine is in motion. The blade, D, is provided with packing saddles or shoes at each end. The cylinder has packing rings, F, and the outside heads, E, are recessed to admit the cylinder heads, C, and are bolted to the case in the ordinary way. The cylinder, B, and the rotating heads, C C, are slotted for the accommodation of the blades, D. Steam being admitted at the steam port, G, forces the extended end of the blade around to the exhaust port, H; before reaching this point, however, the blade passes up the cam, and is shifted endways through the cylinder, B, so that when the upper end of the blade, D, reaches a position in front of the port, G, the expanded steam is exhausted through the pipe, H, and the motion is continued as before, the blade passing around the inside circle of the case, A, and up through the cylinder, B, as it moves forward. The packing rings are placed in a suitable groove in the case, and are pressed against the cylinder heads by means of steam which is admitted through a small passage extending from the steam port to the back of the rings. The saddles at the ends of the blades are attached to the blades by means of a knuckle joint which allows them to adjust themselves to any angle of the wearing surface of the case; the pressure when at work, always keeps them packed against the case, so that the wear of the saddles or case is taken up and a perfect steam joint always maintained. The cut off, as shown in Fig. 1, is a novel feature in this rotary engine; as the steam is exhausted but twice to a revolution, it is perfectly practical, and may be set to cut off the steam at a third or half the stroke, as may be desirable, thus utilizing the expansive force of the steam. One notable point in this engine is the absence of springs or any kind of soft packing. The manufacturers state the joints are so well protected that there is no possibility of the escape of steam until it has done its work.

This engine is the invention of Mr. Alonzo Noteman, of Toledo, Ohio, and it is manufactured exclusively by Messrs. D. E. Saltonstall & Co., of the same place.



NOTEMAN'S ROTARY ENGINE.

Legal Practice in London.

In the legal profession in England there are three distinct and well defined branches of practice; and the boundary lines of the several spheres of enterprise may not be overstepped. The solicitor transacts ordinary business, and advises his client, both as to the avoidance and the redress of grievances. He asserts the rights of the layman who intrusts his interests to his keeping, and avenges the wrongs inflicted upon him by others, so far as these functions can be performed with the aid of the ordinary appliances which the law affords. When matters become more complicated than the simple remedies will suffice to cure, the solicitor seeks the aid of counsel. The client cannot go directly to the latter to the prejudice of the general practitioner at law; nor can counsel transact ordinary business for laymen, however willing they may be to pay his fees or secure his services. An opinion may of course be obtained on the most trivial subject, but the case must be submitted through a solicitor, or counsel cannot entertain it, so that the wider professional interests are duly protected. There is a still more exclusive class of practitioners, who act solely as consultees and leaders—the Queen's counsel—who are prohibited from appearing in most cases before the courts without a junior. By this simple but effective organization of labor, any unseemly conflict of aims and interest is prevented, and the public benefit, not less than the profession, by the arrangement made and carried out.—*Lancet.*

New Pigment Process for Enlargements.

The *Association Belge de Photographie* publishes a pigment process by Dr. Van Monckhoven, which is especially adapted to solar enlargements. He dissolves wax in benzine, charges a small quantity of cotton with the solution, and applies the latter to a light piece of plate glass. The plate is then provided with a coating of collodion or varnish, and then immersed in water for thirty minutes. It is then taken out and placed flat upon a table, where it is coated with a mixture consisting of a colored pigment, gelatine, and bichromate of potassium, which having become firm, the plate is allowed to dry in the dark. In place of this (in addition to this) Monckhoven usually takes pigment paper, sensitized in the usual manner by dipping in a solution of bichromate of potassium, places it upon the collodionized surface of the plate—previously moistened with water—rubs it down in order to obtain perfect adhesion, and finally leaves it to dry. The plate is then exposed in the solar camera (enlarging apparatus) by allowing the picture rays to act, through the plate, upon the film treated with bichromate. The exposure is regulated by the assistance of the photometer. The plate is subsequently immersed in warm water of 30° for fifteen minutes, then in water of 60°, after which the sheet (paper) is detached, and the picture developed in the usual manner. It is then fixed, and a piece of white gelatine paper is finally affixed to the picture by means of the roller. When this has become perfectly dry, the picture is detached. If white gelatine paper be used, which is very brilliant (glossy), the picture will retain its smooth appearance even if it is mounted on cardboard. If, on the other hand, dull looking gelatine paper be employed, the picture will have the appearance of any ordinary print obtained by single transfer. Relative to this process, Monckhoven declares the exposure of the pigment film as adhering to the plate to be essentially new. The following advantages are claimed:

1. The net-like appearance of the pictures and the spontaneous insolubility of the chromo-gelatine will be avoided.

2. A perfect evenness (uniformity) of the paper, and a greater durability of the same, are obtained.

3. All drawbacks of the single transfer process, as imperfect adhesion, air bubbles, and other casualties well known to persons using the pigment process, are successfully avoided.

4. The resulting prints remain perfect, and the pictures are clear and sharp beyond comparison.

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Spiders and Ants—Island of St. Thomas.

A large ground spider (*Lycosa*) is very abundant in the island, inhabiting a hole in the ground about six inches in depth and from half an inch to an inch in diameter, and with a right angled turn at the bottom to form a resting chamber for the spider. Some negro boys dug the spiders out for me. They said that their bite was poisonous, and that they fed on lizards, leaving their holes at night to search for them.

The boys soon grubbed one out with a knife, a great heavy venomous-looking brute about three inches across. It bit savagely at my forceps. The holes of these spiders were so common that on one tolerably clear patch of about an acre in extent they were dotted over the entire area at about one or two feet distance from one another. I noticed the holes at once, and was astonished when the boys told me they were spiders' holes.

A species of white ant (*Termite*) is very common, which makes large globular nests as much as two feet in diameter, and which are perched high up in the fork of a tree. The nests are made of a hard brown comb. From the bottom of the tree covered galleries, about half an inch in breadth, lead up on the surface of the bark to the nest, looking like long narrow brown streaks upon the trunk of the tree. The galleries usually follow a somewhat irregular course up the trunk to the nest, reminding one of the curious deviations which are always to be seen in foot-paths cut out by people walking across fields, in their endeavors to go straight from one point to another. The galleries, or rather tubular ways, for they have bottoms to them, are made of the same tough brown substance as the nests, and are cemented firmly to the bark. Though they are so broad in order to allow numerous ants to pass and repass, they are only high enough for the ants to walk under. I broke one of these galleries, and a number of soldier termites came out and began biting my hands, hardly making themselves felt, but as brave as if they had a sting. I had to break a considerable length of the gallery before I got to any of the working termites, as they had retired from the scene of danger.

A species of peripatus is found in St. Thomas, but I did not succeed in meeting with any. An agouti, a species of rodent (*Dasyprocta*) occurs in the island, and Mr. Wyman told me that it was common in the gullies near his sugar plantation.—*H. N. Moseley, "Notes by a Naturalist."*

THE CYCLODES.

The cyclodes are so called on account of their teeth, the crown of which is rounded, and which reminds of the sharp and cutting teeth of other reptiles that belong to the same class. The cyclodes have a large round trunk, which diminishes regularly from the neck to the extremity of the tail. The tail and body form one piece. The snout is blunt and the tongue is flat, is covered with scales, and has the shape of a lance, with an incision at the end. The eyes are oval and oblique, and are behind the mouth. The neck is very short and narrow. The body is covered with smooth scales arranged like a coat of mail. The claws are small in proportion to the size of the body. The fingers are short, plump, and nearly cylindrical. Three species of cyclodes are found in New Holland—the cyclode of Casnarina, the black and yellow cyclode, and the cyclode of Boddaert.

The giant skink, or the cyclode of Boddaert, is shown in the engraving. It has a more elongated head than the other two species. The upper part of the body is marked with transverse alternating fawn colored and brown stripes. Sometimes these stripes pass down the sides, when the brown or black ones are covered with large yellow spots. Back of the eyes there is a dark stripe which extends as far as the shoulders. In some of the animals the top of the head is reddish, while in others it has a black border. This species attains a length of about fifteen inches.

Like most of the skink family it is very slow in its movements and will lie for hours perfectly immovable, and generally prefers warm and obscure places. While walking the belly drags along the earth, for the legs are short and too feeble to support the body. It lives on pulpy fruit, small animals, and young birds.—*La Nature.*

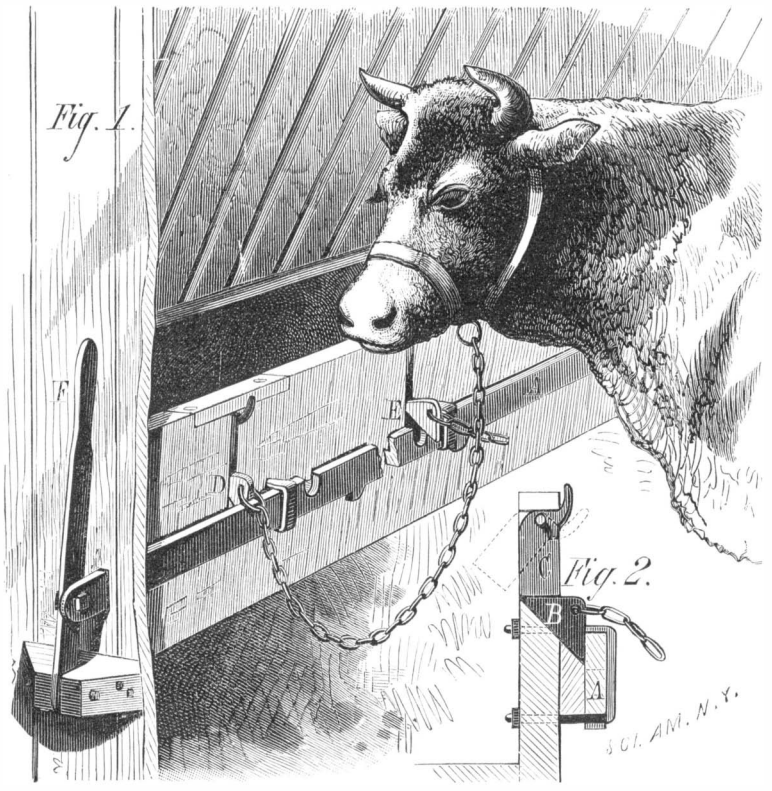
FASTENING AND RELEASING DEVICE FOR CATTLE STALLS.

The practical value of inventions of the class represented in the accompanying engraving can scarcely be overestimated. The frequency of fires and accidents which imperil cattle and horses imprisoned in stalls, has rendered something of this nature an absolute necessity, and its convenience in every day use is worthy of consideration.

The front board of the troughs, or the head walls of a series of stalls, are all arranged in line, and a horizontal continuous bar, A, extends through all of the stalls, and is supported by staples or keepers, and provided with a stop pin which limits its motion. In the headwall, or in the front of the trough in each stall, there is a vertical recess having an inclined bottom running out into the stall. In the upper part of this recess is pivoted a gravity catch or detent, C, which extends downward into the recess just far enough to leave a triangular chamber for receiving the triangular bit, B, which is attached to the end of a chain or rope about the animal's neck. This arrangement is clearly shown in Fig. 2. It will be noticed that the bar, A, extends along in front of the recess which contains the bit, B, and in conjunction with the gravity catch retains the bit.

In the bar, A, there are notches corresponding in position with the recesses in the troughs, and at one end of the bar there is a lever, F, by which it may be moved longitudinally.

There are two ways of releasing the animals. If only a portion are to be released, or if it is desired to release them separately, it may be done by throwing up the gravity catch as shown in dotted lines in Fig. 2. When it is desired to loosen all of the animals as quickly as possible, as in a case of fire, the bar, A, is moved longitudinally by means of the lever, F, bringing the notches in the bar opposite the bits, B, as shown at E (Fig. 1), permitting all of the animals to escape simultaneously.



WATTERS' FASTENING AND RELEASING DEVICE.

This device has met with the approval of farmers' clubs and farmers who have examined and tested it. Further information may be obtained from Mr. James D. Watters, of Bel Air, Md.

Experiments in Cross-Breeding Plants.

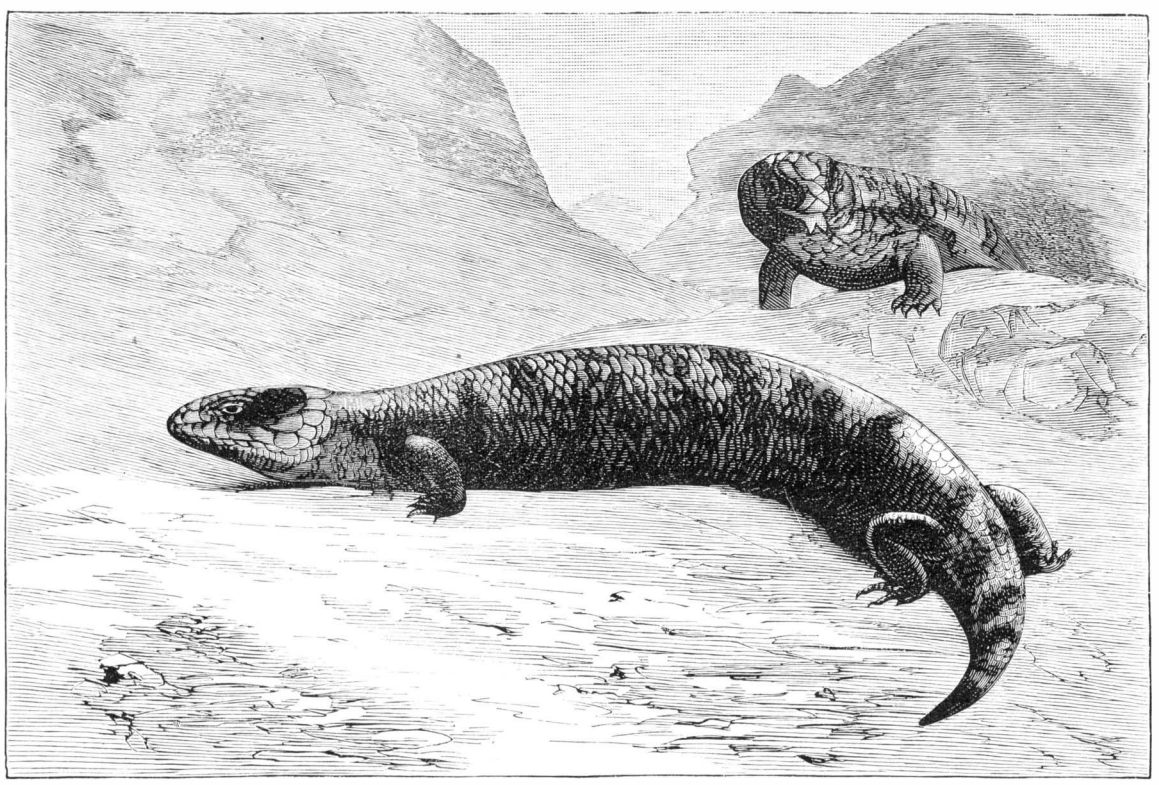
Professor W. J. Beal, desirous of testing the accuracy of some of the statements in Darwin's work, "The Effects of Cross and Self Fertilization of Plants," has been making some experiments, the results of which he records in the *American Journal of Science and Arts.* His first experiments were with Indian corn. Yellow dent corn was obtained from two men in different parts of Michigan. In one case the corn had been kept ten years or more on the same farm, and in the other instance fifteen years or more on the same farm. In both cases the corn was much alike. The two lots were planted in alternate rows in a plat by itself. The tops of one set of rows were all cut off, thus securing a perfect cross on those stalks. Seed from this cross was saved and planted to compare with corn not so crossed. The yield from the crossed seed exceeded the yield of that not crossed, as 153 exceeds 100.

The next experiment was with black wax beans, a variety much cultivated for the purpose of supplying an early crop, and a kind that may be eaten, pod and all, while young. Eight rows were planted, alternately old and crossed stock, and fifteen beans planted in each of the rows. This was on May 31, 1878. On the 22d of July the pods on the two lots of plants were about alike in size, but those fit for cooking numbered 108 on the old stock, and 353 on the crossed; a difference of over three to one in favor of the crossed stock. On August 9th the pods fit for cooking, or past that condition, were 883 on the old stalk and 1,048 on the crossed. On or before the 16th of September all were harvested. The total number of pods was found to be, on the old stock 818 and on the crossed stock 1,859. The beans of the old stock weighed 29·77 ounces, while those of the crossed stocked weighed 70·33 ounces, or nearly in the proportion of 100 to 236. Six lots of fifty beans each were taken at random from the old stock, weighed, and the average for fifty found to be 269⅔ grains. A like experiment with the crossed stock gave an average of 213⅛ grains. The average weight of an equal number of beans from each stock was nearly as 100 to 79 in favor of the old stock.

Poisonous Properties of Laburnum.

The laburnum (*L. vulgare*), a small ornamental leguminous tree very common in our gardens under the name of "golden chain," is quite a favorite with both young and old on account of its being an early bloomer, as well as because its flowers are very pretty.

A writer in the *Gardener's Chronicle* calls attention to the fact that the seeds of this plant act so violently as an emetic that they are justly deemed poisonous, but it seems very little known that all the parts of this tree—leaves, flower pods, and even the bark and roots—are highly dangerous and contain the *cytisin* discovered by Husemann and Marne in 1864. A dose of 0·03 of a gramme injected under the skin is sufficient to cause the instantaneous death of a dog or a cat. Dr. Christison was the first who observed the fatal poisoning of a man by cytisin, and more than a hundred cases of poisoning by this alkaloid, of which the majority were fatal, have been recorded in medical literature. Children particularly, who had eaten of the pods or seeds of laburnum (ten seeds kill a child), but also adults who by mistake had taken flowers of this plant instead of false acacia to prepare a tea, were dangerously affected. The symptoms of this kind of poisoning are not at all characteristic, and unfortunately no antidote is as yet known for it.



CYCLODE OF BODDAERT, AT THE JARDIN DES PLANTES, PARIS.

Japanese Cement.

Mix the best powdered rice with a little cold water, then gradually add boiling water until a proper consistence is acquired, being careful to keep it well stirred all the time; lastly, it must be boiled for one minute in a clean saucepan. This glue is beautifully white and almost transparent, for which reason it is well adapted for fancy paper work, which requires a strong and colorless cement.

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The Steamship Scotia.

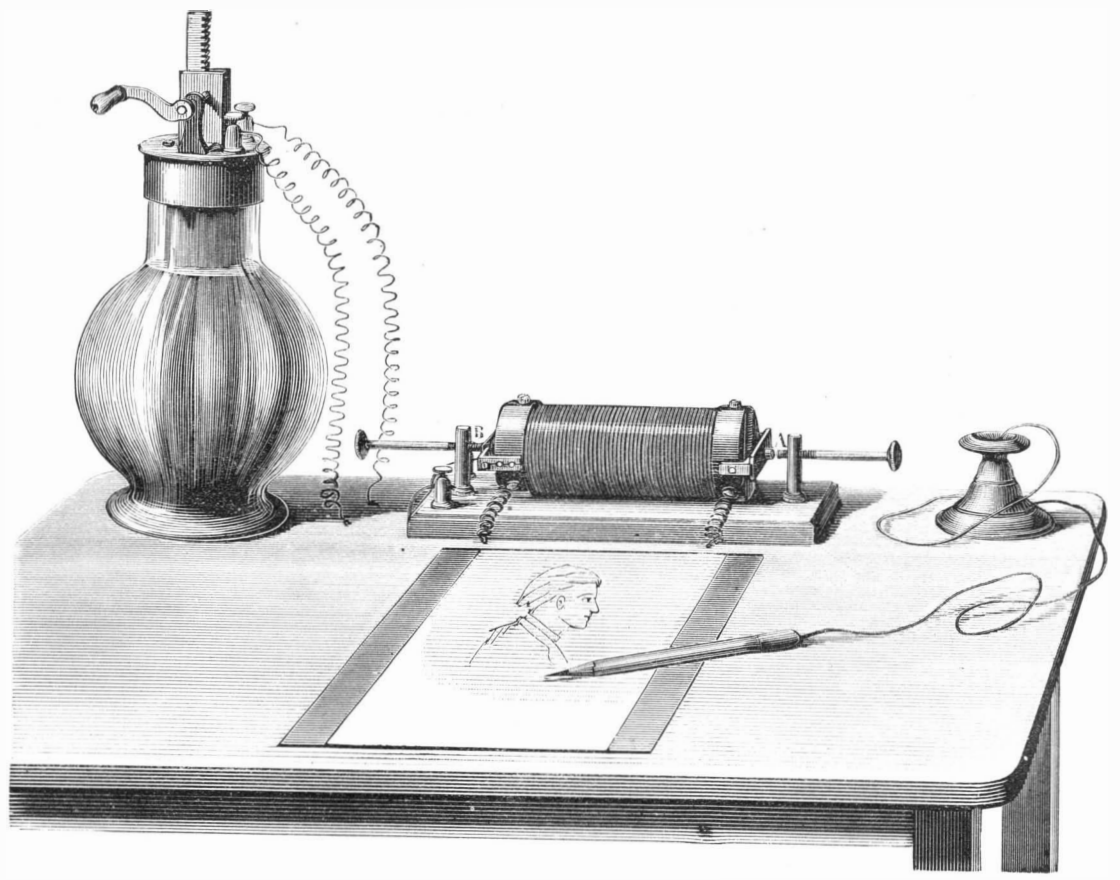
Many of our people, from having frequently crossed the Atlantic in the steamship Scotia, the last side-wheel steamer built for the Cunard Company, will be glad to know what has become of their favorite vessel. A foreign contemporary gives the following account of her:

"Few would recognize in the large twin screw steamer which left the Mersey lately, the once famous Cunard liner Scotia, the last of the great paddle steamers built for the Atlantic trade, and which, under the command of the late Captain Judkins, was for years looked upon as the fastest and favorite vessel on the line between Liverpool and New York. The Scotia was built in 1862, when, with the exception of the Great Eastern, she was probably the largest mail steamer afloat, being about 400 feet long over all, 47 feet 8 inches beam, and 4,050 tons builder's measurement, and fitted with a pair of side lever engines of 1,000 horse power. The introduction of screw steamers fitted with compound engines for the Atlantic and other ocean voyages has, of late years, entirely superseded the paddle steamers, and a few years back the Scotia was withdrawn from the Cunard Company's sailing list, and was subsequently purchased by the Telegraph Construction and Maintenance Company to be employed in their cable-laying operations. Extensive alterations were made by Messrs. Laird Brothers, at Birkenhead Ironworks. The Scotia has been stripped of her masts, funnels, machinery, paddle wheels and paddle boxes, deckhouses, etc.; she has also been raised by the addition of a spar deck, and altered about the after end to prepare her for twin screws, and has been fitted with new compound engines, and also provided with three immense cylindrical tanks in which to stow the electric cable, as well as with most elaborate and approved steam machinery for paying out and hauling in, also steam capstan, steam steering gear, winches, etc. The new engines are two distinct sets, on the compound system, with inverted cylinders, 38 inches, and 66 inches diameter, and 3 feet 9 inches stroke, supplied with steam at 75 lb. pressure from three double-ended cylindrical boilers, and are calculated to drive the vessel at a speed of about 11½ knots an hour.

THE ELECTRIC PEN.

Our engraving, which we take from *La Nature*, represents a new electric pen devised by Messrs. Bellet & Hallez d'Arros, who deserve credit for having remedied several imperfections which existed in the first instruments made on this principle.

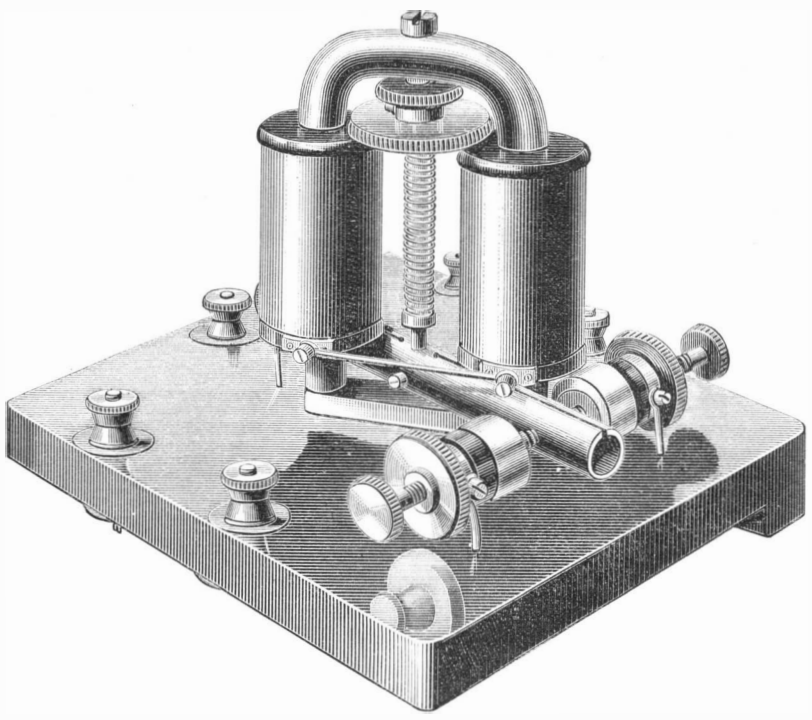
This pen was suggested by the familiar experiment of piercing a card by the passage of an electric spark from a Leyden jar. The spark of an electric machine or an induction coil passing between metallic points or between a point and a conducting body is capable of piercing a card, and will, of course, much easier puncture a sheet of paper. When the sheet of paper rests upon a metallic plate and the surface is traversed by the electric pen, the plate and the pen being connected with the poles of an induction coil, a line may be produced by a series of very fine perforations, which will vary in number in a given space with the rapidity of the discharges and the rate of the movement of the pen. The principle of the pen is very simple, but before the practical utilization of it was reached, many difficulties had to be surmounted. Among these we may mention the tendency of the sparks to burst forth, when the pen is within a short distance of the paper, puncturing the paper in all directions, making it impossible to draw a clear line from the start. The operator was also liable to severe shocks. Another difficulty was the distance between the successive perforations. These imperfections have been overcome by Messrs. Bellet & Arros, by reducing the strength of the secondary current, so that it has only sufficient power to pierce the paper, and will not, therefore, give a perceptible shock. The paper which is to form the stencil is dipped in a solution of salt and dried; this operation prevents too many sparks from issuing from the pen, and insures an absolutely true and clear line. The interrupter is of novel form and is operated by the magnetized core of the induction coil. The apparatus forms a desk of medium dimensions. At one side of the desk there is a plunging bichromate battery; the induction coil is placed in the middle and is connected by one of its wires with the lead of an ordinary lead pencil, which serves the double purpose of making a visible mark on the paper and of conducting the current. The metallic plate which supports the paper is also connected with the coil and is secured to the desk top. When it is desired to take an impression from the stencil it is placed over a sheet of paper, and rolled with printer's ink reduced with a little printer's varnish or with castor oil.



NEW ELECTRIC PEN.

A NEW SOUNDER.

The accompanying illustration represents a sounder for direct working or translation, and of which over one hundred have been constructed for the telegraph lines in India.



A NEW FORM OF SOUNDER.

It differs from an ordinary sounder in the arrangement of the armature, which is supported by a vertical spiral spring. This spring serves to restore the position of the armature when the current ceases, as well as to relieve the lower bearing of nearly all friction. The prolongation of the armature acts as the beam, and plays between the two stops shown in the engraving.

To insure very good insulation for damp climates, the coils are rendered solid by repeated immersions in a compound of resin and beeswax (for hot climates, ten parts of resin and one of wax answers well). The range of the instrument is shown by its working without fresh adjustment, either with one Daniell's cell through 6,000 ohms or with 20 through 0. When very delicately adjusted, one Daniell's cell through 31,000 ohms is just able to work the instrument if the stops be extremely close together. —*G. Dubern, in Journal of the Society of Telegraph Engineers.*

NEW AGRICULTURAL INVENTIONS.

An improvement in the class of churns having a reciprocating dasher which is operated by a spring motor, has been patented by Mr. W. L. Allegru, of Hebbardsville, Ky. This improvement relates to the construction of the churn cover, which is composed of two separate disks, the lower one being designed for gathering the butter.

An improved churn dasher, constructed so as to give the milk a continuous rotary motion as the dasher is moved up and down, has been patented by Mr. Seth K. Warren, of Louisville, Ky. The invention consists in wings eccentrically pivoted to arms attached to the dasher handle.

A cultivator that is constructed so that its teeth may be elevated or depressed at will, so that it may be hauled or drawn over the road on its own wheels, has been patented by Mr. Wm. Jones, of Mill Point, N. Y. It will cultivate or make a furrow close to a fence or hedge.

An improved machine for stacking and ricking hay and straw has been patented by Mr. B. E. Jones, of Boonville, Mo. The invention consists in a combination of devices which cannot be readily described without an engraving.

Mr. A. W. Meyer, of Labaddie, Mo., has devised an improved straw elevator for thrashers and separators, which consists in the combination of a fan blower, a pivoted screen held in a horizontal position by a weighted arm, and a conductor spout, with a stacker having cross slots in its floor.

An improved sulky scraper, constructed so that it may be readily adjusted to the various positions required for collecting, carrying, and dumping the load by the driver from his seat, has been patented by Mr. William C. Marr, of Onawa, La.

Mr. James M. Matthews, of Knoxville, Tenn., has patented an improved plow, which has a semicircular iron beam upon which the mould board is made adjustable.

Mr. Sam. T. Ferguson, of Minneapolis, Minn., has patented an improvement in horse rakes, which consists in a yielding or flexible lever, which may be held by the hand of the driver, and which may be readily changed to a rigid lock lever which will hold the teeth of the rake to the ground without the aid of the driver.

The Fur on the Tongue.

The nature of the fur on the tongue has been the subject of a study by Henry T. Butlin, F.R.C.S., and the results of his investigation are given in a paper read at a recent meeting of the Royal Society. The author finds that tongue fur consists chiefly of (1) débris of food and bubbles of mucus and saliva, (2) epithelium, (3) masses which at first appear to consist of granular matter, but which are the glœa of certain forms of schistomycetous fungi. In order to ascertain the true nature of the glœa, and to obtain it in a purer form, it was cultivated upon a warm stage. Several fungi were discovered, but only two of these were present in every instance, *Micrococcus* and *Bacillus subtilis*, and as the glœa produced artificially was similar to that existing naturally in the tongue fur, it is believed the fur is composed essentially of these two fungi.

Micrococcus developed freely and abundantly, forming large masses of yellow or brownish yellow color. *Bacillus* did not develop, but existed in greater or less abundance in all the cases examined. It appeared to be identical with the *Leptothrix buccalis* described by Robin. Although it did not develop under artificial conditions, it is probable that development takes place freely upon the surface of the tongue. Its habitual occurrence there, and the presence of spore-bearing filaments, favor this view. Besides these fungi there were present in more or less abundance, *Bacterium termo*, *Sarcina ventriculi*, *Spirochæta plicatilis*, and a larger form of *Spirillum* or *Vibrio*. The first of these fungi existed in some of the furs, and twice developed with great rapidity. The second was frequently present, and generally developed quickly, forming large masses of a yellow or yellowish brown color. The *Spirochæta* occurred in only two or three of the specimens examined.

The slime between and around the teeth was found to consist of the same fungi as the tongue fur, but the rods of *Bacillus* were longer, probably owing to fewer disturbances.

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AN OLD CONCERN RE-ESTABLISHED.

Horace Waters & Son, dealers in musical instruments in this city, made an assignment not long ago to secure their creditors. Mr. Waters, Sr., after thirty years' experience; hopes, by enterprise, economy, and fair dealing, to re-establish his business and to retain his old customers. To this end, he has opened a store a No. 40 East 14th St., and acts as agent for a number of leading musical instrument manufacturers.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion, about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

The best results are obtained by the Imp. Eureka Turbine Wheel, and Barber's Pat. Pulverizing Mills. Send for descriptive pamphlets to Barber & Son, Allentown, Pa.

Steam Tug Machinery, Engines, Boilers, Sugar Machinery. Atlantic Steam Engine Works, Brooklyn, N.Y.

Walrus Leather, Solid Walrus Wheels; Wood Wheels covered with walrus leather for polishing. Greene, Tweed & Co., 18 Park Place, New York.

Slate. Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

We will rent whole or part of third story in our building, with power for light manufacturing. Size, 40 x 80 feet · has 25 windows and power elevator. Located on N. Y Central Railroad. Rome Revolver and Novelty Works, Rome, N. Y.

Milling attachments for Lathes. W. Main, Piermont, N.Y.

Improved Blind Staples. B. C. Davis, Binghamton, N.Y.

Trout sure to bite. Cir. free. Hill & Co., Lawrence, Mass.

H. W. Johns' Asbestos Liquid Paints are strictly pure linseed oil paints, and contain no water. They are the best and most economical paints in the world.

A party owning, free of debt or other incumbrance, in an excellent location, a new, neat, and substantial factory, fitted with needful power, machinery, tools, patterns, and materials, and in successful operation, manufacturing an entirely new, first-class sewing machine, for which a first-class patent has just been allowed, of which he is sole owner, desires entirely reliable parties of ability, experience, and cash, to take charge of the manufacturing and sales departments in a partnership or stock company Best references exchanged. Address P. O. Box 343, Chicago, Ill.

Wanted—Machinist, with small capital, to invest in a good business, to take charge as foreman of a foundry and machine shop Apply to or address W. B. McKeldin, Athens, McMinn Co., East Tenn.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For Stationary or Portable Engines, Circular Saw Mills, Grist Mills, and Mill Machinery, good and cheap, address the old manufacturers of Cooper Mfg. Co., Mt. Vernon, O.

H. Prentiss & Co., 14 Dey St., New York, Manufs. Taps, Dies. Screw Plates, Reamers, etc. Send for list.

For Screw Cutting Engine Lathes of 14, 15, 18, and 22 in Swing. Address Star Tool Co., Providence, R. I.

The Horton Lathe Chucks; prices reduced 30 per cent. Address The E. Horton & Son Co., Windsor Locks, Conn.

Lincoln's Milling Machines; 17 and 20 in. Screw Lathes. Phœnix Iron Works, Hartford, Conn.

Boilers ready for shipment. For a good Boiler send to Hilles & Jones, Wilmington, Del.

Shaw's Mercury Gauges, 5 to 50,000 lbs.; accurate, reliable, and durable. T. Shaw, 915 Ridge Ave., Phila., Pa.

A Cupola works best with forced blast from a Baker Blower. Wilbraham Bros., 2,318 Frankford Ave., Phila.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Forsaith & Co., Manchester, N. H., and 213 Centre St., New York. Specialties.—Bolt Forging Machines, Power Hammers, Combined Hand Fire Engines and Hose Carriages, new and 2d hand machinery. Send stamp for illustrated catalogues, stating just what you want.

Linen Hose.—Sizes: 1½ in., 20c.; 2 in., 25c; 2½ in., 29c. per foot, subject to large discount. For price lists of all sizes, also rubber lined linen hose, address Eureka Fire Hose Company, No 13 Barclay St., New York.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J.

The Lathes, Planers, Drills, and other Tools, new and second-hand, of the Wood & Light Machine Company, Worcester, are being sold out very low by the George Place Machinery Agency, 121 Chambers St., New York.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

American Fruit Drier Mfg. Co., Chambersburg, Pa.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Vertical Burr Mill. C. K. Bullock, Phila., Pa.

Eclipse Portable Engine. See illustrated adv., p. 414.

Diamond Engineer, J. Dickinson, 64 Nassau St., N.Y.

Vertical Engines. F. C. & A. E. Rowland, N. Haven, Ct.

Excelsior Steel Tube Cleaner, Schuylkill Falls, Phila., Pa

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel — other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Pulverizing Mills for all hard substances and grinding purposes. Walker Bros. & Co., 23d & Wood St., Phila., Pa.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Machine Cut Brass Gear Wheels for Models, etc. (new list). Models, experimental work, and machine work generally. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N. Y.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of this week.

We have opened a sample depot for American goods, and wish to negotiate with manufacturers seeking Spanish markets. We shall be glad to receive catalogues, price lists, and samples of American products. Address Herrero Hermanos, Cadiz, Spain.

Downer's Anti-Incrustation Liquid.—J. W. Hamburger, Wholesale Furniture Manufacturer, Hester and Elizabeth Sts., New York, says: "Your Boiler Liquid is a success. I am using hard well water, but your Liquid prevents the formation of scale, and my tubes are clean. I shall continue to use it, and heartily recommend it to others." A. H. Downer, 17 Peck Slip, New York.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N.Y. Wm Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new Injector, worked by a single motion of a lever

Best Power Punching Presses in the world. Highest Centennial Award. A. H. Merriman, W. Meriden, Conn.

Deoxidized Bronze. Patent for machine and engine journals. Philadelphia Smelting Co., Phila., Pa.

Having enlarged our capacity to 96 crucibles 100 lb. each, we are prepared to make castings of 4 tons weight. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Milling, Profiling, Cam Cutting, Revolving Head Screw Machines. Pratt & Whitney Co., Hartford, Conn.

Hand Fire Engines, Lift and Force Pumps, for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N.Y., and 93 Liberty St., N. Y. city, U.S.A.

NEW BOOKS AND PUBLICATIONS.

ORIGIN, PROGRESS, AND DESTINY OF THE ENGLISH LANGUAGE AND LITERATURE. By John A. Weisse, M.D. New York: J. W. Bouton. 1879. 8vo, pp. 701.

If not the first, certainly the most thorough and comprehensive, study of the origin, development, and verbal structure of English speech that has ever been made by scientific methods. In its preparation Dr. Weisse has studied with singular acuteness and patience the vocabularies of typical British writers in every age from the year 597 to the present, tracing the origin of the words used, and the varying percentages of words drawn by different writers in successive ages from the different sources — Anglo-Saxon, Gothic, Danish, Swedish, German, Dutch, Flemish, Welsh, Cornish, Scotch, Irish, Armoric, Greek, Latin, French, Italian, Spanish, Portuguese, Russian, Arabic, Hebrew, and Armaic—all of which have fed the grand stream of English speech. Contrary to popular notions, English as at present spoken is, in its vocabulary, about three-quarters Græco-Latin and one quarter Gotho-Germanic or Anglo-Saxon. In other words but one-quarter of the words in use by English writers and speakers have come from the latter family of languages, and the tendency is and has been steadily toward the increasing of the percentage of Græco-Latin words. As to the destiny of the English language, Dr. Weisse believes with De Candolle that in a century or so it will dominate the world. The English speaking peoples are a multiplying, colonizing, conquering race. Already they command nearly half the world's commerce, though numbering but one-fifth the world's population. They have more books and newspapers than all the rest of the world, and more inventors and inventions. In directness, compactness, and simplicity of grammatical structure, English speech surpasses all other languages—properties which make it everywhere the language of the telegraph—and it only needs rectification as regards its spelling to be suitable for universal adoption. Dr. Weisse's book is a mine of curious and valuable information, and has made its mark as one of the few great works of the age.

MAGNETIC VARIATION IN THE UNITED STATES. By J. B. Stone, Ph.B., C.E. New York: 1878. 12mo, pp. 139. Price $1.50.

Every practical surveyor will appreciate the advantage of a compilation of the recorded facts in relation to the variation of the compass throughout the United States. This Mr. Stone has been at great pains to make, and to supplement his tables with such information as will enable the surveyor to determine easily the allowance that must be made in any case for the difference in variation between any dates. There is added a brief account of the nature of terrestrial magnetism, the various theories as to its origin, its change in intensity, and duration, and the progress of magnetic observation. The book may be had of Mr. Stone, Boonton, New Jersey.

GRAPHICAL COMPUTING TABLE. By Lieut. William H. Bixby, U. S. A. New York: John Wiley & Sons.

It would be impossible to say, without a wide and varied series of practical tests, whether this ingenious table is a curiosity merely, or an instrument of great practical utility. The credit of its construction is given to Lalanne, French Inspector General of Bridges and Highways. It certainly enables one to arrive at the results of many complicated mathematical operations almost by simple inspection. If we had much of that sort of work to do we should not hesitate to undertake the mastery of its use. The time and labor spent on its preparation surely ought to bring some practical return. Young office workers may do well to give it a trial. The errors are said to be within one half of one per cent.

REPORT OF NEW YORK STATE SURVEY FOR 1878. James T. Gardner, Director. Albany: C. Van Benthuysen & Sons.

The field work of the past year was principally upon that part of the central belt of triangles from Albany westward, lying in the counties of Oneida, Madison, Onondaga, Oswego, Cayuga, Wayne, Seneca, and Yates. The measurements embraced an area of about 2,000 square miles, in one of the most wealthy and populous parts of the States, containing two important cities and nearly two hundred villages and hamlets. Every one of these towns was found to be misplaced from one to two miles on all existing maps.

PLASTERER'S MANUAL. By K. Cameron. New York: Bicknell & Comstock. pp. 53. Price 75 cents.

A practical little handbook describing the tools and materials used in plastering, the appearance and action of different limes and cements, methods of making and applying mortar, and giving, in small space, a large amount of information useful to plasterers. Both publishers and author have done their work well.

AN EXPOSITION OF CREATION. By Rev. Joseph Gross. Philadelphia: William Syckelmoore. pp. 135. Price 40 cents.

Mr. Gross is an aged clergyman who sticks to Genesis, literally. Genesis is right; geology clashes with Genesis; therefore geology is wrong. The logic is good. The usual custom is to assert that Genesis means what it does not say; then build up a scheme of geology resting more on imagination than on fact; then say that geology and Genesis agree. Mr. Gross is guilty of no such folly. He does not know much about geology, further than that it does not agree with a literal interpretation of Genesis i. and ii. His major premise being, to his mind, unassailable, his conclusion is inevitable. Geology and Genesis cannot be harmonized without mutual destruction. He rests on Genesis.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) G. M. writes: I want to make an engine, 6 inches stroke and 4 inches diameter, of brass. How large should the ports and exhaust be, and how can I make the cores for the same? A. Steam port ⅜x2½ inch, exhaust ⅝x2½ inch. Consult a moulder on other points.

(2) W. W. asks: Does the upturning of virgin earth (not marshy districts) from 1 to 20 feet deep, and filling up hollows, produce malaria in any form? A. No, not in a healthy region. Still if any one in the neighborhood should afterwards suffer from an illness which the attending physician was too ignorant or too lazy to discover the cause of, the patient would probably be told that he was a victim of malaria. Malaria appears to be a convenient verbal pack-horse for a wide range of medical ignorance.

(3) G. H. O. asks (1) for a recipe for a preparation for sealing bottles that is insoluble in alcohol. A. Soften glue in cold water and melt it in the water bath to form a very thick paste. To this add good glycerine in quantity equal to the dry glue taken, and continue the heating to expel as much of the water as possible. This may be cast on a marble slab to cool, and melted for use as required. This is not soluble in alcoholic liquids. 2. Is there any liquid as good as alcohol, but cheap, for preserving insects, snakes, etc.? A. Alcohol is one of the best; a solution of arsenious acid may be employed for insects.

(4) J. S. B. writes: I contemplate putting in an engine to run my presses and heat the office. About two effective horse power will be required, and the office is about 20x40, 9 feet high. 1. Will either of the engines of the following dimensions do the work, and which will be the best? One is, cylinder, 3½x6 inches, 250 revolutions per minute, boiler of the locomotive style, diameter 23 inches; length of furnace, 23 inches; width of furnace, 18 inches; height of furnace, 16 inches; number of tubes, 18; diameter of tubes, 2 inches; length of tubes, 41 inches. The other is, cylinder, 4x6 inches, 240 revolutions per minute; boiler upright; diameter, 24 inches; height, 60 inches; number of tubes, 26; diameter of tubes, 2¼ inches; length of tubes, 36 inches; grate surface, 207 square feet. A. Use the larger engine, 4x6. 2. Will it be necessary to place the boiler below the level of the heating coils? A. No, you can use a trap to return the water to the boiler. 3. Will it be of any use to attempt to utilize the exhaust steam? A. Utilize it by heating the feed water.

(5) C. L. H. asks for some method of keeping moulding clay moist for some length of time. A. Mix a little glycerine with the water.

(6) C. E. A. asks what cement to use for fastening mineral specimens to woods—as in making mineral caskets. A. Good glue or sealing wax answers very well. Thick solution of shellac in alcohol or in a hot aqueous solution of borax will also answer the requirements.

(7) E. A. R. asks how to preserve natural flowers. A. The fresh leaves are spread and pressed into a suitable dish with alternate layers of fine, thoroughly dry sand, as hot as the hand can bear. When the sand has cooled they may be removed, smoothed, and dipped for a few moments in clear French spirit varnish, and allowed to dry in the air. By many melted white wax is preferred to the varnish. This latter must not be too hot. The dried leaves are dipped in the melted wax, drawn several times over the edge of the vessel to remove excess, and hung up until the film of wax is thoroughly cooled and hardened.

(8) H. T. N. writes: I have a marine barometer and do not understand exactly what effect the atmosphere has on it to foretell rain, snow, or wind, etc. I have asked others that have them; they differ, and appear to know no more than myself. Please give rules by which the changes are indicated. A. High winds and storms are usually preceded by a sudden falling of the mercury. The approach of fine weather is indicated by the rising of the mercury. The rising of the mercury in winter indicates frost; in frosty weather it indicates snow; while its fall indicates a thaw. In sultry weather coming thunder is indicated by the falling of the mercury. When the height of the mercury alters slowly, the kind of weather indicated will continue for a long time. If it falls, it will be foul; if it rises, it will be fair. Fluctuations in the mercurial column indicate changeable weather. These rules may be relied on in a general way. No positive rules can be given.

(9) W. H. D. asks: What will color charcoal and tallow a dark red—a good permanent dye? A. We know of no satisfactory method of dyeing charcoal red. Perhaps the admixture of a small quantity of red ocher or Berlin red with the tallow would answer the requirements.

(10) J. S. writes: I am engaged to some extent in brass casting, using old metal almost exclusively. I am unable to make sound castings, and desire some information. It is not the fault of the moulds, as I have no trouble with new metal. The trouble seems to be a sort of white scum of oxide which forms very rapidly, which, going into the mould with the metal, makes the castings porous and rotten. A. Stir the molten metal well with a stick of green wood, and sprinkle the surface with a little dry argol and sal-ammoniac before pouring.

(11) C. T. E. asks: 1. What are the ingredients and quantities for manufacturing black and brown hair dyes? A. See p. 348, Cooley's "Cyclopedia of Practical Receipts." 2. What is the best method of preparing violin rosin? A. Moisten the powdered rosin thoroughly with turpentine spirits, agitate with about ten parts of water, and boil the milky liquid for an hour. Filter dry, and fuse the residue at a gentle heat.

(12) J. C. W. writes: In the May 10th number of the SCIENTIFIC AMERICAN, under "Notes and Queries," W. A. B. asks how to procure powdered silver such as is used in the Righi telephone. You suggest a mechanical process. I beg leave to offer the following, which is mainly an old chemical method, and may or may not answer the requirements of W. A. B.: Make a solution of nitrate of silver by dissolving the crystallized salt in pure distilled water, and of such strength as that about 60 grains shall be in one gallon of the water. By making the solution stronger or weaker, more or less coarseness of the powder will result. After solution is made immerse in it a strip or strips of clean copper sheet, and set the whole aside for about 24 hours, when the silver will have been precipitated upon the strips of copper in a finely divided metallic state. I am inclined to the opinion that frequent or constant agitation of the liquid will produce a better result than if the precipitation is allowed to proceed undisturbed, but cannot say positively that it will. After the action is completed shake or agitate the vessel so as to detach the loosely adhering coat of silver from the copper strips, and having removed the latter, collect the silver by filtering the liquid through paper, rinsing all the precipitate into the filter. After the water has passed wash the precipitate with water containing one or two per cent of aqua ammonia until all the copper (or cupric nitrate) is removed from the silver powder. Any accidental chloride of silver will be thus removed also. Then let the water drain out of the filter until it ceases to drip, when a continuation of the washing may be resumed, using strong alcohol. This will displace most of the water. After this wash out the alcohol with stronger ether or ether containing no water, then expose the filter (opened freely to the air) to a warm temperature, avoiding the approach of flame, for fear of setting fire to the ether. The precipitate will dry rapidly and may be easily rubbed to a fine soft metallic powder by passing through a fine sieve.

(13) S. M. L. writes: 1. I wish to construct a wheel seven inches in diameter and two inches thick. The wheel runs diametrically, one half in vacuum and one half in open air. The wheel sits horizontally, the shaft being vertical. The distance between bearings is about five inches. What is the smallest sized iron or steel shaft I could use with safety? I estimate the side pressure to be about 210 lbs. A. 9-16 inch. 2. If a tube be placed in water, and the air exhausted from the tube, the water will rise about 30 feet. If a turbine wheel were placed in the tube, about on a level with the surface of the water, would the water exert a force on the wheel equivalent to a fall of 30 feet in open air, supposing the weight of the water above the wheel to be taken off? A. No. 3. Is there any safe rule for estimating the horse power of turbine wheels under a given pressure, and the number of revolutions they will make, and the amount of water they will pass, in a given time? A. Turbine manufacturers have such rules. 4. Can you name a good reliable history of the attempts to invent perpetual motion machines, one which gives sketches and descriptions of the most important plans that have been devised by inventors? A. "Perpetuum Mobile, or Search for Self Motive Power," by H. Dircks.

(14) C. A. S. writes: In the SCIENTIFIC AMERICAN, page 230, volume 38 (April 13, 1878), is given a process for copying tracings by the aid of photography. It is claimed that this process will give a copy in dark (deep blue) lines on a white ground. I have repeatedly tried the process, over and over again, but have not yet succeeded in getting the result desired. The best result I can get is a copy of dark blue lines on a nearly equally dark blue ground, the ground being only a shade lighter than the drawing, however long I may leave the paper exposed to the light. Will you please inform me what the trouble is? A. Potassium ferrocyanide produces in solutions of the ferrous (proto) salts a bluish white (nearly white) precipitate, which by absorption of atmospheric oxygen speedily acquires a distinct blue color. The remedy is obvious—shorten the time of exposure to the air, dilute the solutions employed somewhat, and wash thoroughly immediately after exposure.

(15) R. V. H. asks: How can I make a silvering solution so I can apply with a cloth and have a silver plate? I have a recipe but it rubs off with the hand. The recipe is as follows: 2 drachms nitrate of silver; 4½ drachms water; 1 drachm sal ammoniac; 4 drachms each chalk and soda. A. The silver deposited in this manner is a mere wash and cannot be expected to stand much handling. A better wash than the one referred to is prepared as follows: Dissolve ½ ounce silver nitrate in a small quantity of water, warm, agitate this with about

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1-3 ounce of pure hydrochloric acid, and let the precipitate subside. Wash this (silver chloride) several times, by decantation, with hot water. Dissolve ¼ lb. of potassium cyanide in soft water; add this gradually (warm) to the precipitate until the latter is completely dissolved, and dilute the solution to one gallon. Dip the articles (brass or copper) to be silvered in strong hot potash solution, rinse in water, scour with a brush and fine pumice, rinse again and dip in the cyanide bath. If a dark deposit is obtained, add more water to the bath; if it coats slowly, add more silver chloride. As the silver is gradually abstracted more of the chloride must be added. If properly silvered the work will admit of polishing. A trace of grease or dirt on the work will spoil the deposit. Cyanide of potassium is very poisonous, and care should therefore be taken to avoid introducing it, through cuts or otherwise, into the system.

(16) T. A. writes: I am thinking of getting a condensing steam engine, and have been told that this kind of engine takes some 20 to 30 times more water (for condensing purposes) than would a non-condensing engine. Could I use two wells for this purpose, by running the condensed steam (water) to the second well, and then the next day use this same water for condensing purposes again; and then running it to the first well again, and so back and forth, using the same water over and over again day after day; and if so how much water would be actually lost or evaporated each day, say in a 12 hours' run with 50 horse power engine? A. Your mode of using two wells will answer if they are of sufficient capacity to give time for one to cool off while using water from the other. The water should, in cooling, be reduced in temperature about 40 degrees. If your boiler and engine are tight, the loss would probably not exceed 5 per cent. But is a condensing engine necessary in your case, and if so, why?

(17) O. E. writes: I want to make an electro-magnet capable of lifting 1 ounce ¼ of an inch. 1. What size and length of wire and core ought I to use? A. Make the cores 1½ inch long, ½ inch in diameter, wind them with 6 or 8 layers of No. 20 covered wire. 2. What battery and conducting wire will be best, circuit about 15 feet? A. If for continued use, use two or three cells of gravity battery. If used occasionally, one cell of Grenet or Bunsen would do. For conducting wire use No 16. 3. How should I fasten the wire to the core? A. The wire is not fastened to the core. For method of making magnets and full particulars as to proportions, resistance, etc., see SCIENTIFIC AMERICAN SUPPLEMENT No. 182, article on Electro-Magnets, illustrated by over 50 cuts.

(18) E. C. B. writes: In a recent query, C. R. H. asks if it is possible for a number of persons to move a table by electricity by placing their hands upon it, without pressing upon it? You simply answer "no." Now I would like an explanation. I have been one of seven who moved a table in this way, it going around the room in a circle. We placed the legs in saucers. Time to start about twenty minutes. If it is not the electric current, what is it? A. Muscle generally, sometimes muscle combined with a vacuum formed in the palms of the hands of some of the table movers.

(19) H. G. A. S. asks: Will you be kind enough to tell me what about is the total strain on a 7⅓ octave piano? A. A 7 1-3 octave large concert grand, of Steinway & Sons' make, bears a total strain of 66,000 lb. Parlor grands of the same make average 30,000 lb. strain each; and upright pianos, having also three strings to each note, from 20,000 to 25,000 lb., according to size; the square grand pianos, 7 1-3 octave, being partly 3 stringed to each note, about 20,000 lb; 7 octave square pianos, two strings to each note, about 16,000 lb. each. 2. Some thorough work on tuning and temperament? A. The only standard work, in which tuning and temperament are most scientifically treated, which we know of as translated into the English language, is "Professor Helmholtz's Toue Sensations."

(20) C. R. N. writes: 1. If there be a small aperture in a steam boiler, say one half inch in diameter, will the steam exert a greater force to displace a plug driven into it having a square end than if the end were sharp and tapering; if so why? A. No, the pressure acts upon the total area of the opening. 2. Which has the greatest power with an equal force applied, a crank or an eccentric, the throw being equal? A. An eccentric is simply a crank.

(21) E. A. W. asks: 1. Can a circular saw be made to revolve so rapidly that it will not cut? A. No. 2. Which is the better conductor, a rapidly revolving saw or one at rest, or, in other words, will lightning strike one sooner than the other? A. We think there would be no difference. 3. Which will run easier, a wheel with boxing much too large for spindle, or one having boxing that fits the spindle neatly? A. Well fitted boxes best; the shaft is then always in proper line. With slack boxes it generally would be out of line.

(22) J. T. E. asks: 1. What is the striking force of a pile hammer falling twenty-two feet, weight nineteen cwt.? A. 35½ tons. 2. What will prevent water from foaming in steam boilers? What causes it to foam? A. There are many causes for foaming, and different remedies are accordingly required. Often a little oil forced into the boiler will check the foaming temporarily.

(23) J. H. B. asks: 1. Can a current water wheel be made that can be used successfully for running a flouring mill, and if so what is the plan for such a wheel? A. Yes. 2. Can the motion of machinery propelled by such a wheel be governed, and how? A. By a proper mill wheel governor. 3. What should the quantity and velocity of a current of water be to produce a 25 horse power? A. Consult a good millwright or engineer as to the special conditions of your case.

(24) E. M. asks (1) if it would be advisable to have small pump exhaust into boiler chimney. A. It would be a mere question of convenience. 2. Why is a siphon indispensable to a steam gauge? A. To interpose between the steam and the diaphragm of the gauge a short column of water, which prevents the heat of the steam from affecting the gauge.

(25) A. L. G. asks if expansion joints can be used with success in a line of steam pipe one hundred and twenty feet long. We have a great deal of trouble in keeping our unions tight; the steam is used for heating purposes, one line of piping 120 feet, one line of waste pipe 120 feet long, which enters a steam trap. A. Yes, with entire success, if you put in enough of them and it is properly done.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

C. A. J.—It is chalcocite or copper glance, with malachite—a valuable ore of copper if found in sufficient quantity. The per cent of copper in it can only be determined by a quantitative analysis.—A. S.—The so-called ore consists chiefly of iron sulphide, bronze powder or Dutch gold leaf (brass), sheet metal clippings, and mercury. Evidently an attempted imposition.—E. J. L.—The gravel consists chiefly of quartz and mica, Some of this may prove auriferous.—No name.—The specimen contains much silica, iron, and lime. It may prove useful for the manufacture of bricks, cheap pottery, etc.—E. B. S.—Quartz pebbles.—W. M. B.—The object is a fossil one of the extremities of the internal bone or shell of a *Belemnite*, a cephalopod which was very abundant during the Cretaceous Period, to which the green sand of your State belongs. The animal was allied to and much like the cuttle fishes and squids of the present day. The portion you send is what the scientists call the *phragmocone*, and was divided into deeply concave air chambers (which you may see by holding a specimen up to the light), and these were connected with each other by a tube. It was originally exceedingly delicate, and owes its preservation in its present hard state to the infiltration of calcareous spar.

COMMUNICATIONS RECEIVED.

On a Mathematical Discovery. By J. C. M.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

May 20, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Adjustable bracket, E. T. Starr (r) 8,723
Advertising tablet, J. E. Phillips 215,665
Air compressor, J. B. Pitchford 215,540
Air, purifying, circulating, etc., A. J. Chase 215,572
Album, J. Kena. 215,524
Amalgamating ores, apparatus for, J. H. Rae 215,672
Animal trap, T. G. Rice 215,480
Apple corer and cutter, Gunn & Mendenhall 215,605
Arches and floors, apparatus for supporting centers for masonry, W. Erwin 215,595
Assayer's self-calculating sample and button weigher, J. S. Phillips 215,477
Awning, E. C. Cook 215,437
Axle box, car, J. H. Covel 215,508
Bag holder, C. A. Bikle 215,502
Bale band tightener and tier, S. H. Gilman 215,451
Bale tie buckle, T. J. McCaffrey, Sr. 215,529
Bales from presses, ejecting, S. H. Gilman 215,450
Banjo, R. McManus 215,647
Barrel crozing machine, T. McKeever 215,646
Base and cap plate, R. Miller 215,533
Bed, S. J. Daily 215,579
Bed bottom, F. D. Kennedy 215,631
Bed bottom, E. L. Matteson 215,528
Bed bottom, spring, B. Schapker 215,482
Bed bottom, spring, P. Williams 215,702
Beehive, Byrd & Perkins 215,569
Beer casks, regulating pressure in, F. Fehr 215,596
Beer cask washer, F. Fehr 215,597
Beer, making, Meller & Hofmann 215,679
Belt, electric, C. R. Kruger 215,637
Belt fastener, Budlong & Talcott 215,567
Belt fastener, A. Loehner 215,470
Berth, sleeping car, F. C. Hills 215,618
Blotting sheet, B. B. Hill 215,520
Bolt blanks, manufacture of, W. E. Ward 215,494
Boot and shoe heel, B. Bradshaw 215,563
Boot and shoe seam, J. Jory 215,460
Boot and shoe seams, covering stay for, C.D. Wood 215,706
Boot and shoe uppers, crimping, S. Moore 215,534
Boot rack, H. C. Macdonald 215,641
Boot treeing machine, J. E. Crisp 215,440
Bottle stopper, W. H. G. Savage 215,682
Bottle stopper fastener, A. W. Porter 215,668
Bracelet, M. Kayser 215,461
Bracket, A. D. Judd 215,523
Brake shoe clamp, J. Taylor 215,691
Brick, etc., maker, H. Guthrie 215,606
Bridge, R. Hoover 215,522
Bucket, butter and egg, G. J. Cook 215,576
Butter package removable casing, G. J. Record 215,674
Butter print, J. R. Kinerson 215,633
Button hole guard, G. W. Prentice 215,541
Calendar support, Pruyn & Hyatt 215,669
Car coupling, J. G. Baader 215,552
Car coupling, W. H. Maple 215,644
Car coupling, I. R McCormick 215,645
Car coupling, G. H. Wilson 215,497
Carding engine, R. F. Barker 215,501
Carpet lining, H. B. Meech 215,648
Carriage bow, F. D. Parry 215,476
Carriage wheel wrench, N. R. Pratt 215,479
Carriages, safety trace catch for, C. Reinhold 215,678
Caster, pepper and salt, W. B. Dean 215,441
Centrifugal machine, S. Baxendale 215,428
Cereals, prepared, L. S. Chichester 215,573
Chain link, C. W. Levalley 215,469
Check marker, bank, C. B. James 215,624
Cheese boxes, machine for reducing the height of, E. D. Perkins 215,538
Child's chair and carriage, D. Gleason 215,601
Cider press, M. P. Schenck 215,483
Clay, purifying fire, W.T., C.M., & W.T. Christy, Jr. 215,434
Cloak blanket, C. A. Hodgman 215,619
Clock case, S. C. Spring 215,708
Coal deliverer, A. B. & T. C. Davis 215,510
Collar fastening horse, Moore & Cameron 215,652
Colter and jointer, G. Dodge 215,587
Cornet, W. C. Fietz 215,598
Corset, E. W. Bigelow 215,560
Corset bone pocket, W. A Nettleton 215,655
Cot and bed bottom, spring, E. Olmsted 215,475
Cotton gin, W. S. Beeder 215,676
Crank, automatically and positively adjustable, W. H. Clark 215,435
Curtain fixture, W. C. Sharp 215,484
Desk, school and other, R. T. Hoffman 215,620
Distance instrument, W. Allderdice 215,500
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STRONG TESTIMONY.

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Engineer for Dunnell Mfg. Co.

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Family Washer
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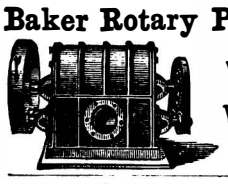

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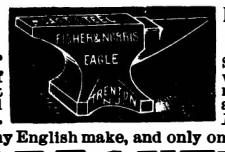

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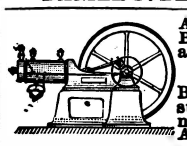

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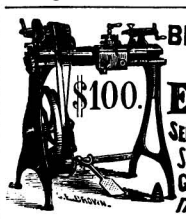

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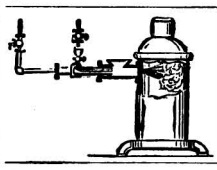

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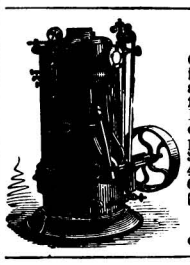

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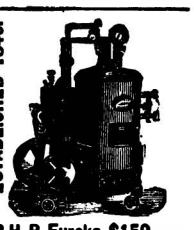

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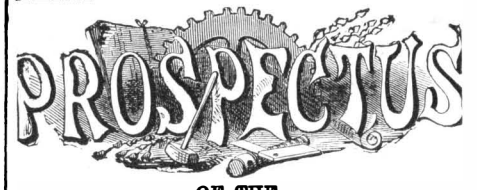

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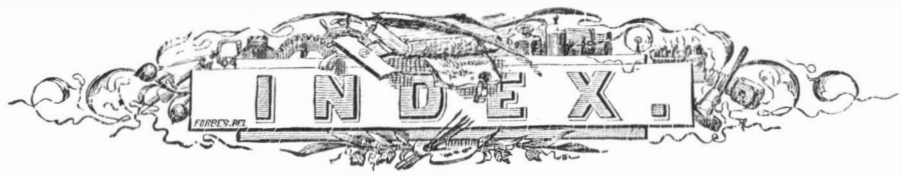

ILLUSTRATIONS.

A

Accident to a stag, remarkable.. 279
Acoustic apparatus, new..... 207
Amalgamator, improved..... 275
Amateur mechanics.....52, 100, 164, 223, 340, 404
American chameleon..... 119
American industries.....31, 111, 127, 159, 177, 271, 287, 305, 319, 337
American patents, some recent.. 211
Apparatus, automatic safety..... 102
Apparatus, physical, easily made 35
Apparatus, sulph. hydrogen..... 56
Aquarium, Brighton..... 23
Assyria, discoveries in..... 377
Attachment, imp. for feed pumps 358
Automatic safety apparatus..... 102
Automatic siphon, new..... 216
Autophone, the..... 351
Awning, window, improved..... 72

B

Baggage fastener, novel..... 246
Barrel for shipping liquors..... 103
Barrel, improved, shot gun..... 263
Bed, invalid, new..... 403
Belting machine, new..... 134
Belt holes.....(5) 27
Belts, slipping, preventive for.... 388
Bench plane, new..... 5
Bicycle, Columbia..... 35
Billiard table manufacture..... 313
Bird box, novel..... 228
Bit, bridle, novel..... 53
Boat, torpedo, who invented the 50
Bobac, the 215
Boiler, steam, new..... 342
Boiler tubes, Jerrold's..... 41
Boilers, new attachment for..... 227
Bolt, door, improved..... 198
Bolting cloth inspector, new..... 326
Book covers, new protector for.. 131
Boot and shoe heel, novel..... 86
Bottle, water, silver..... 249
Box, convenient, for artists..... 262
Box, packing, new..... 182
Brewing, ale..... 159
Brick-making by machinery..... 243
Bridges, suspension, of the U. S.. 335
Bridle, bit, novel..... 53
Bronze work, Vienna..... 10
Buffalo, Cape..... 231
Burr mills, vertical, French..... 178

C

Cabinet, elegant..... 297
Calamar, the..... 313
Can, fruit, improved..... 115
Cape buffalo..... 231
Carburetor, new..... 262
Carpenter's plane, new..... 1
Car stove, new..... 86
Carriages, manufacture of..... 79
Chatodan, the..... 39
Chair, a rich..... 329
Chameleon, American..... 119
Chameleon, the 375
Check, door, novel..... 131
Chest of ebony..... 105
Chopper and cultivator..... 118
Circle squared, the..... 242
Clay pipes and their manufact're 82
Clipper injector..... 37
Cloth, machine for stretching... 227
Combination tool for merchants. 387
Condenser, a new..... 374
Cooler, novel..... 22
Cornice, window, improved..... 387
Corn planter and drill, new..... 99
Crat, forceps 231
Crab-spider, the great..... 263
Cream raising apparatus, new... 134
Crusher, ore, novel..... 194
Cup, drinking, Greek..... 344
Cut-off for steam engines, new... 310
Cyclode, the..... 407

D

Designs for vases..... 73
Desk, satchel, new..... 323
Desmognath, the brown..... 329
Device, for cattle stalls..... 407
Dies for pipes and bolts..... 325
Digger, potato, new..... 67
Discoveries in Assyria..... 377
Dock, floating, depositing..... 147
Door bolt, improved..... 198
Door check, novel..... 131
Dough kneader, new..... 246
Drainage..... 360
Drill, ratchet, new 132
Drinking cup, Greek..... 344

E

Eagle owl, oriental..... 135
Echinodermata, interesting..... 391
Edible mussel..... 345
Electric illumination..... 25
Electric lamp, Krupp..... 402
Electric lamp, new..... 184
Electric light, divisibility of..... 383
Electric light, Edison's..... 184
Electric light, Rapieff..... 4
Electric light, the Edison..... 185
Electric light, Wallace-Farmer.. 54
Electric pen, new..... 408
Electric pen, simple 121
Electro-magnet wire.....(14) 44
Elevator, water, improved..... 278
Ellipsograph, a simple..... 324
Emery wheel stand, improved.... 294
Engine and boiler, Demenge..... 66
Engine of the Destroyer..... 63
Engine, pumping, duplex steam. 37
Engine, rotary, new..... 326
Engine, rotary, novel..... 259
Engines of the yacht Isa..... *239
Equine antelope..... 343
Excavator, Belgium..... 54
Expedition, scientific, Woodruff. 83

F

Faience and its manufacture.226, 255
Feed pipes, choked..... 21
Feed pumps, imp'd attachm't for 358
Fence, hurdle, new..... 163
Fender, new, for vessels 230
File guard, improved..... 191
Finishing press, improved..... 386
Fire and water indicator..... 102
Firearm, new..... 56
Fireplace, Elizabethan..... 57
Floating dock, depositing..... 147
Flower stand..... 393
Flying frog..... 247
Foot lathe, new..... 5
Forceps crab..... 231
Forging mandrel, new..... 166
Fox, Fennec or Sahara..... 247
Frog, flying..... 247
Fruit can, improved..... 115
Furnace, Casson-Dormey..... 22
Furnace, imp'd, burning garbage 198

G

Garden, window..... 295
Gasteropods, terrestrial..... 359
Grain mill, scientific..... 34
Greek vase, ancient..... 199
Green Carolina auolis..... 119
Grid, hydraulic, new..... 291
Governor, elect'c c'rr't, Siemens' 184
Gun tool, new..... 131
Gyroscope and pendulum..... 41

H

Hammer, steam, new..... 358
Handpiece for dental engines.... 117
Hay press, new..... 371
Heel, boot and shoe, novel..... 86
Hoe, scuffle..... 387
Hog, penciled ear..... 55
Homes, old, made new..... 265
Honey extractor, new..... 179
Honey, what we find in..... 149
Hook, whiffletree, new..... 118
Horograph, Wilson's..... 377
Horseshoe, calk, continuous..... 53
Horseshoe nails, manufacture of 127
Humpback whale..... 135
Hurdle fence, new..... 163
Hydrant, improved..... 390
Hydraulic grid..... 291

I

Ibis, straw-necked..... 169
Ice caves, formation of..... 296
Ice creeper, new..... 115
Ice-making apparatus, new 166
Illumination, electric..... 25
Index, revolving, new..... 18
Indicator, fire and water 102
Induction balance, Edison's..... 245
Induction balance. Prof. Hughes' 244
Industries, American.....31, 48, 79, 111, 127, 159, 177, 287, 305, 319
Injector, Clipper..... 37
Inspirator, Hancock..... 99
Invalid bed, new..... 403
Inventions, recent..... 38
Inventions, recently patented... 150
Ironing table, new..... 194

J

Japanese mirrors..... 280
Journal bearing, anti-friction.... 278

K

Kanchil, or pygmy musk..... 311

L

Lamp, electric, new..... 184
Lard, manufacture of..... 67
Lathe, foot, new..... 5
Lattice, bronze, or fire guard..... 24
Lawn mower, improved..... 211
Loading apparatus for ordnance. 230
Locomotive, a new..... 292
Locomotive, road and farm..... 102
Locust, shielded, or papua..... 87
Lubricants, testing 306
Lubricene, manufacture of..... 95
Luray cavern, the..... 153

M

Machine for softening silk..... 150
Machine for stretching cloth..... 227
Machinery, therapeutic..... 290
Mandrel, forging, new..... 166
Mangle, improved..... 294
Manufacture of carriages..... 79
Manufacture of horseshoe nails. 127
Manufacture of lard..... 67
Manufacture of lubricene..... 95
Manufacture of reed organs..... 111
Manufacture of sugar.....47, 49
Manufacture of wire..... 319
Mechanics, amateur.....52, 100, 164, 223, 340, 404
Microphones, improved..... 324
Milk cooler..... 292
Miller's Falls Tool Works..... 175
Milling machine..... 386
Mirrors, Japanese..... 280
Motor, a novel..... 338
Motor, Gary's..... 144, 196, 273
Motor, magnetic, Gary's..... 151
Motor, saturator and regul't'r for. 51
Moulding, carv'g and panel'g ma. 323
Musical condenser, improved..... 6
Mussel, edible..... 345

N

Nail experiment, Gary's..... 242
Nails, horseshoe, manufacture of 127
Neck yokes, improvement in..... 115
Neutral line, Gary's..... 196

O

Octopus at Berlin Aquarium..... 103
Oiler, a novel..... 85
Old homes made new..... 265
Orchis family, the..... 327
Ordnance, loading apparatus for. 230
Ore crusher, novel..... 194
Organs, reed, manufacture of.... 111

P

Packing box, new..... 182
Paper cutting and wind'g mach . 300
Parallel vise, double screw..... 7
Patents, American, some recent. 211
Pedal, switch, new..... 63
Pedometer, a new..... 246
Pendulum showing rot. of earth, 338
Pen, electric, new 408
Pen, electric, simple..... 121
Pen, stencil, new 195
Phonograph, a sixpenny..... 356
Physical apparatus, easily made 35
Piano, eary English style..... 40
Pile, thermoelectric, to make...(5) 395
Pipes, clay, and their man'f'ct're 82
Pipes, feed, choked..... 21
Plane, bench, new..... 5
Plane, carpenter's, new..... 1
Planer and matcher, Sweepstakes 147
Potato digger..... 67
Pottery, gray..... 264
Pottery, Turkish, specimens of... 361
Polishing machine, emery brand. 278
Porcupine, the..... 71
Praxinoscope, the..... 181
Press, improved, an..... 214
Projectile, winged, new..... 376
Provision, safe, new..... 344
Pulley, clutch, new..... 277
Pulleys, iron and steel rim..... 89
Pumping engine, duplex steam.. 37
Pump, lift, rotary..... 51
Pump, reciprocating..... 355
Pump, steam, Dean Brothers..... 243

R

Railway track, novel..... 98
Ratchet drill, new..... 132
Reflector for candles..... 291
Regulator, engine, novel..... 195
Regulator for clocks, pneumatic. 130
Rheostat, the principle of ....(13) 44
Road and farm locomotive..... 102
Road plane, improved.....*390
Rolls, rolling mill .....(7) 27
Rotary engine, new..... 326
Rotary engine, new..... 406
Rotary engine, novel..... 259
Ruler, parallel, improved..... 118

S

Sack holders and lifters..... 19
Sample case, new..... 372
Satchel desk, new..... 323
Saw mill, brand..... 1
Saw, shop, new 403
Scientific expedition, Woodruff.. 83
Scuffle hoe..... 387
Sewing and floss silk..... 100
Sewing machines..... 271
Shawl carrier, novel..... 246
Shear, squaring, new..... 82
Shipping tag, new..... 211
Shot-gun barrel, improved..... 263
Silk, sewing and floss..... 100
Siphon, automatic, new..... 216
Sixpenny phonograph, a..... 356
Smallest steamboat, the..... 143
Smoke stack, locomotive, imp'd. 86
Snake, DeKay's..... 217
Snapping turtle, giant..... 183
Snow flanger, improved..... 372
Sounder, new 408
Spectacles, improvement in. 293
Sponge fishing in the Adriatic.... 167
Sponges, calcareous..... 281
Sponges, glass 200
Spool thread, manufacture of.... 237
Squaring shear, new..... 82
Steamboat, the smallest..... 143
Stencil pen, new..... 195
Stool of inlaid wood..... 361
Stove, car, new..... 86
Sugar, manufacture of.....47, 49
Suspension bridges of the U. S.... 335
Switch controller, new..... 399
Switch pedal, new..... 63

T

Table, cast iron, fine..... 233
Table, improved..... 50
Table, ironing, new..... 194
Tag, shipping, new 211
Telephone, a, 28 years ago..... 261
Telephone, el't'o-chem., Edison's. 260
Telephone, Righi's..... 186
Telephones and sounders..... 282
Telegraph, writing, Cowper's.... 197
Testing lubricants..... 306
Testing machine..... 179
Therapeutic machine 290
Thrasher, straw scale, etc..... 339
Threading machine, new..... 374
Thread, spool, manufacture of... 287
Thunderbolt, Bawlkin Green..... 169
Tiller, steam, new..... 191
Tool, combination, for merch'nts 387
Tool works, Miller's Falls..... 175
Tobacco manufact'ry, Lorillard's 15, 17
Torpedo boat, who invented the.. 50
Torpedo launch, Herreshoff..... 210
Track, railway, novel..... 98
Tree, a wonderful..... 121
Trough, watering, for cattle..... 227
Turbine, Victor..... 166
Turkish pottery, specimens of.... 361
Turtle, snapping, giant..... 183
Type writer, improved..... 98

V

Vase, Alhambra..... 137
Vase, Greek, ancient..... 199
Vases, designs for..... 73
Vise, parallel, double screw..... 7

W

Wagon, steam, new..... 116
Washer cutter, improved..... 163
Washing machine, improved..... 217
Water bottle, silver..... 249
Water elevator, improved..... 278
Water trough for cattle..... 227
Waterworks, Chichester..... 18
Whale, humpback..... 135
Window awning, improved..... 72
Window cornice, improved..... 387
Window garden..... 295
Winged projectile, new..... 376
Wire, manufacture of..... 319
Woodcock, three-legged..... 23
Writing telegraph, the..... 376

Y

Yak, the..... 295
Yokes, neck, improvement in.... 115

MISCELLANY.

Figures preceded by a *star* (*) refer to illustrated articles.

A

Academy notes..... 343
Academy of Sciences..... 277
Academy of Sciences, New York, 242, 328
Accident, remarkable, to a stag..*279
Acid, anhydrous, sulphuric..... 20
Acid, nitric by electric light..... 56
Acid, salicylic with boracic..... 20
Acoustic apparatus, new..... *207
Advice, original, for drinkers.... 116
Advice to young physicians..... 152
Africa crossed again..... 193
Agassiz, anecdote of..... 373
Ailanthus, the, as timber..... 234
Air, cooked..... 106
Air, impure, in sleeping rooms.(3) 91
Alarm for bell telephone.....(8) 123
Ale brewing *159
Alligators taught by experience. 225
Alloys..... 3
Aluminum 197
Amalgamator Co., Forster-Firmin 385
Amalgamator, improved..... *275
Amateur mechanics.....*52, 100, 164, 223, 340, 404
Amber and its source..... 168
American industries.....*31, 97, 111, 127, 159, 177, 271, 287, 305, 319, 337
American industries, new..... 372
American mutton..... 361
American Middlings Purifier Co. 68
American patents, recent..... 372
American products in England... 405
American tools, Netherlands, open to..... 2 4
Amyl nitrate in ague..... 360
Anaesthetic, new..... 321
Angora goats turned to profit.... 359
Aniline black, to dissolve.....(2) 123
Animals, effect of a sea voyage on. 312
Anthracite.....(11) 27
Antimony in galvanic batteries.. 106
Antimony in the system..... (4) 91
Ants, parasol of Texas..... 183
Apparatus, automatic safety.....*102
Apparatus, ingenious..... 262
Apparatus for testing petroleum. 342
Apparatus, physical, easily made. *35
Apparatus, sulphur hydrogen..... *56
Apple trees, borers in..... 266
Apple worm, notes on the..... 313
Appointments, important..... 263
Aquarium, Brighton..... *23
Archæology 89
Architects' trials & tribulations.. 249
Arctic expedition, Swedish..... 33
Armor, cast steel, for ships..... 312
Around the world in thirty days, 259
Arsenic, antidote to..... 321
Arsenic, dangers of..... 130
Arsenic, effect of on the body.... 146
Art as an aid to industry..... 241
Artisans, American and English. 209
Asa Packer's life. 374
Asphaltum, how prepared....(12) 107
Assyria, discoveries in..... *377
Astronomical notes..... 7, 73, 152, 216, 282, 344
Astronomical phenomenon..... 294
Atmospheric air and the vacuum. 70
Atmosphere, geol'g'c'l relationsof 120
Attack, submarine..... 83
Australian exhibition..... 401
Australian letters..... 154
Autophone, the..... *351
Awning, window, improved..... *72
A word to insurance officers..... 326
Axles, buggy, setting.....(3) 155

B

Back numbers..... 233
Back numbers and volumes..... 160
Bacteria, useful 230
Baggage fastener, novel *246
Baking powders..... 7
Baking powders, alum..... 136
Baking powders and glucose..... 21
Baldness, treatment of..... 42
Balloon expedition to the moon. 262
Bamboo, industrial uses of..... 279
Barnum (Mr.) calls for a new invention..... 209
Barometers, aneroid..... 84
Barometer, aneroid..... 201
Barometer, rules for..(8) 409
Barrel, improved, shot-gun *263
Barrel for shipping liquors.....*103
Batcheldor, Samuel 128
Battery, bichromate, new and constant..... 169
Battery, Bunson, to make .....(4) 43
Battery, Leclanche.....(1) 155
Battery, Maynooth.....(13) 123
Beds, insulated..... 362
Bed, invalid, new.....*403
Beer drinking in the U. S..... 249
Beer and milk, profit on..... 259
Bees, utility of..... 384
Bees, what became of one hive... 266
Beetling machine, new.....*134
Belt holes.....(5) *27
Belt and wheels, emery..... 224
Belts, slipping preventive for.....*388
Belting, speed.....(46) 219
Better late than never..... 272
Bicycle, Columbia.....* 35
Bicycle, the, as a practical road vehicle 257
Biliousness, remedies for 258
Billiard balls, to color.....(4) 123
Billiard table manufacture.....*313
Binders, wire, trouble with..... 145
Bird box, novel.....*228
Birds, trade in..... 266
Birds, useful and mischievous.... 38
Bismarck's brains, curiosities of. 264
Bit, bridle, novel.....*53
Blasting by compressed air..... 258
Blacking, bronze.....(17) 107
Boat, torpedo, new..... 119
Boat, torpedo, who invented the. *50
Bobac, the.....*215
Boiler attachment, Matthews'.. 240
Boiler feeders for locomotives.. 33
Boiler, locomotive, h. p. of (42).. 60
Boilers, new attachment for.....*227
Boilers, steam..... 136
Boiler, steam, new.....*342
Boiler tubes. Jerrold's.....*41
Bolt, door, improved.....*198
Bolting cloth inspector, new *326
Book covers, new protector for.*131
Books at auction, rare old..... 211
Books, chemical .....(8) 59
Boot and shoe heel, novel.....*86
Boring insects, barrel..... 296
Boring insects powder barrel.... 319
Botany, curiosities of 7
Bottle, water, silver.....*249
Box, convenient, for artists.....*262
Box, packing, new *182
Boxwood, supply of..... 39
Brackets, parlor, to finish .....(5) 43
Bradley jig tried on bit. coal..... 161
Brain, recuperating the..... 83
Brain work and skull growth.... 373
Brass, malleable 57
Brass, porous castings.....(10) 419
Bread, fresh and stale..... 90
Bread, snow-raised..... 199
Breakwater, Block Island..... 342
Bridge, a long..... 329
Brewing, ale.....*159
Brewery, long-lived..... 241
Brewers' convention..... 401
Breathing noxious vapors, eff. of 326
Brick making by machinery.....*243
Brick making on the Hudson..... 394
Bridge, East River, security of.. 209
Bridge, Niagara.....(54) 219
Bridge, railway, lifting a..... 280
Bridge, steel, large..... 280
Bridges, suspension of the U. S..*335
Bronzes and bronzing..... 122
Bronzes, Japanese..... 24
Bronze work, Vienna..... *10
Acoustic apparatus, new.....*207
Buffalo, cape.....*231
Buffalo, domestication of the.... 213
Buffalo, fate of a herd..... 264
Burr mills, vertical, French.....*178
Butter, preservation of..... 67
Butter, rancid, purifying..... 319
Butter, stale, to rework.... (2) 27

C

Cabbage worm..... 266
Cabinet, elegant.....*297
Cable, African..... 264
Cable, Atlantic 321
Cable, South African 278
Cables, ocean, life on 169
Calamar, the *313
Can, fruit, improved *115
Canal project, Canadian..... 227
Canal, ship, new,..... 177
Canal, Suez, the.. 240
Canal, the Isthmus..... 385
Cane Mill wanted, improved 129
Cannon shot, how velocity is measured 133
Cans, fruit, old, how to utilize... 33
Canvas, artists,' to prepare (l).... 59
Capital and labor, earnings of ... 40
Car drivers' maladies..... 117
Carb. of soda for whoop. cough.. 72
Carbon, a new form of..... 145
Carburetor, new..... 262
Carpet beetle, remedy for the... 105
Carpet beetles, etc., remedies for 282
Carriages, manufacture of..... 79
Cases, watch, silver, to clean (29) 59
Castings, English vs. American.. 265
Catalpas, the 24
Cattle drive, Texas, for 1879..... 228
Cattle, great market for 65
Cattle, mute..... 211
Catte raising in Montana..... 55
Catalpa, the, as a timber tree.... 297
Caustics, new..... 56
Cavern, Luray 36, 58
Celluloid, applications of..... *225
Cement for brass collars.....(7) 107
Cement for cast iron 182
Cement for glass 184
Cement for metal and glass..... 104
Cement, minerals to wood.....(6) 409
Cement or paste, good.....(4) 59
Cement, receipt for.....(9) 91
Cement for rubber and wood (3) 395
Cement to stick rub. to iron (49) 219
Cement for uniting met. to glass. 243
Chætodon, the..... *39
Chair, a rich..... *329
Character, formation of..... 307
Charity, co-operative 16
Chameleon, American..... *119
Chameleon, the. *375
Check, door, novel..... *131
Cheese, American, in England.... 116
Cheese, Roquefort, how made..... 72
Chest of ebony..... *105
Chlor.of ammon., dissociation of 166
Chem. at Columbia College, N. Y. 165
Chemical, new..... 138
Chemistry in schools and col..... 20
Chestnuts, horse, uses for..... 167
Chicle, or Mexican gum..... 277
Children, small 166
Chimney flues..... 198
Chimpanzee, male, anat. pecul.. 180
Chloral a poison antidote 362
Chloride of lime as insecticide... 213
Chloride of mag. in gas meters.. 360
Chlorophyl..... 117
Chopper and cultivator *118
Chronometer, the..... 161
Cider, artificial ... .(6) 91
Cigar ship, a new..... 374
Circle, to find the area of.....(17) 44
Circle, the, not squared..... 261
Circle squared, the.....*242
Citric acid..... 400
Civilization and invention..... 69
Clay, to keep moist.....(5) 409
Cleveland lighted by electricity. 289
Clifford, William Kingdon... 295
Clock dials, self-luminous..... 232
Clock, pneumatic 377
Clock dials, self-illuminating.... 180
Clocks, pneumatic 196
Close work..... 376
Cloth, machine for stretching....*227
Clothes moths..... 346
Clothing in its relation to health 355
Coal, Am., at the Mediteranean. 343
Coal, American in Switzerland.. 321
Coal bunker defenses..... 117
Coal field, Ohio..... 213
Coal fields, Western Iowa..... 213
Coal at its lowest 242
Coating iron with irid. copper.. 355
Cochrane ring, defeat of the..... 21
Cod, catching with nets..... 50
Coliseum, the, drained..... 249
Colleges, have we too many ?.... 227
Collodio-bromide..... 407
Colors, aniline..... 25*
Color blindness..... 38
Colors, poisonous..... 102
Comets, origin of..... 132
Common sense..... 232
Communications, rapid 357
Competition, Australian..... 116
Compress. air for blast. in mines 356
Condenser, a new.....*374
Condenser, water for.....(16) 410
Coney Island pier..... 344
Confectioners, veg. green for.... 64
Conflagration, a great..... 289
Coniferine and vanilline..... 234
Constitution, the ship..... 374
Consumption, cause of..... 337
Convention, social science..... 81
Convict labor..... 137
Cooler, novel..... *22
Cooper, Peter, as an inventor 193
Cooper, Peter, honor to..... 128
Copper, Lake Superior 132
Copper, refined .....(6) 218
Coral..... 279
Coral beds near Sicily..... 53
Coral, precious..... 378
Corn planter and drill, new..... *99
Correspondence, Washington.... 84
Cotton mills for China..... 362
Cotton worm moth..... 375
Cotton worm, the..... 313
Cotton, prospects of..... 324
Cotton, water-proofing..... 249
Cottons, English, how loaded.... 163
Cows, vegetable..... 329
Crab-spider, the great *263
Crab, forceps *231
Cranberry marsh, Wisconsin.... 211
Crawshay, Robert..... 368
Cream-raising apparatus, new..*134
Crematory urns, scented 325
Crow, a plea for the..... 231
Crusher, ore, novel..... *194
Cucumber, tape-worm in..... 231
Cut-off for steam engines, new..*310
Cyclode, the.....*407

D

Dangers of Wall street..... 342
Daniel Craig McCallum, Gen..... 37
Dead Sea, the, to be utilized..... 169
Death, physical consequences of. 132
Decision, railway, important.... 2
Decision Supreme Court..... 216
Delirium tremens, treatment of.. 179
Dentistry, progress of..... 133
Dentistry, Chinese..... 66
Dentistry, early..... 362
Design patents..... 336
Desmognath, the brown..... *329
Detroit river tunnel and bridge.. 309
Devil fish, capture of a..... 248
Device, a suggestive..... 324
Device for cattle stalls..... *407
Dew..... 277
Diamonds, how to distinguish... 132
Dies for pipes and bolts..... *325
Dime novels, better than..... 232
Diphtheria..... 154
Diphtheria, how spread..... 65
Diphtheria, history of..... 133
Diphtheria in fowls..... 261
Diphtheria, spreading by kisses.. 41
Diphtheria, sulphur for..... 38
Dinosaurs, American..... 55
Discovery, disagreeable..... 39
Disinfection by cold..... 117
Disinfection..... 399
Diseases among children..... 382
Disorder of bank clerks..... 330
Distance of the sun from earth . 291
Dock, floating, depositing..... *147
Does invention discourage labor. 132
Dome, observatory, paper..... 113
Dough kneader, new..... 246
Dove, Heinrich Wilhelm..... 261
Drainage..... *360
Drainage of Lake Fucino..... 10
Drawings rendered ineffaceable. 169
Drill, ratchet, new *132
Drilling, rock, by electricity..... 339
Drinking cup, Greek..... *344
Dynamo-el'ctr'c m'chine, d'ble.(5) 218

E

Eagle owl, oriental.....*135
Earth, virgin, not malarious...(2) 409
Earthquakes .....(24) 59
Eastlake, who is he ?.....(9) 43
Echinodermata, interesting.....*391
Eclipse, solar, of 1880..... 90
Economy of corporation..... 371
Education, agricultural..... 86
Education, discipline of..... 307
Education, hand training in..... 321
Education in China 338
Education, undue haste in..... 146
Eel, winter habits of the..... 312
Eels, breeding of..... 8
Eels, discovery of..... 292
Eels, reproduction of..... 101
Egg trade, the. 154
Electric battery, cheap.....(35) 59
Electric lamp, Krupp..... *402
Electric current, prac, app. of.... 1
Electric illumination..... *25
Electric illuminator, Edison's.... 305
Electric light, Am. history of.... 2
Electric light, brush..... 296
Electric light, divisibility of..... *383
Electric light, early history of.... 40
Electric light, Edison's..... 102, 184
Electric light, floating..... 97
Electric light improvem't, latest.. 104
Elect'c light, Prof. Tyndall on the. 180
Electric light, Rapieff..... *4
Electric light, Sawyer-Man..... 145
Elect'c light, small and cheap.(12) 44
Electric light, subdivision of..... 97
Electric light, the..... 358
Electric light, the Edison.....*185
Electric light, to make.....(32) 59
Electric light, Wallace-Farmer.. *54
Electric lighting..... 138
Electric lighting, progress of..... 272
Electric light in Cleveland..... 329
Electric light in a fish market.... 354
Electric light in London..... 51
Electric light in mining..... 373
Electric light in N. Y. P. O..... 330
Electric light in Paris..... 320
Electric lighting in Paris, cost of. 164
Electric pen, new.....*408
Electrical lighting, notes on..... 74
Electricity in silk winding..... 40
Electricity, statical..... 233
Electric'ty, st'tic'l, phen'm'non in 194
Electro-magnet wire.....*(14) 44
Electrotype, battery for.....(8) 91
Electrotype process, new..... 105
Elements, transmutation of..... 48
Elevator, water, improved..... *278
Elevators, American in Europe .. 401
Ellipsograph, a simple.....*324
Emery mines of Chester Co., Pa. 82
Emery wheel stand, improved...*294
Emigration and migration 160
Emigration to the United States. 338
Emory.....(37) 59
Employment and labor in Mass.. 338
Enemies of the electric telegraph. 385
Engine and boiler Demenge..... *66
Engine, economical..... 33
Engine, locomotive, largest..... 50
Engine, pumping, duplex steam.. *37
Engine, rotary, novel.....*259
Engine, st'm, small hor. to make (30) 59
Engine, small stationary.....(10) 218
Engine, steam, Heslop..... 229
Engine, steam, small.....(10) 395
Engine, steam, vs. the horse..... 178
Engine of the "Destroyer"..... *63
Engineering, locomotive.....(37) 396
Engines of the yacht Isa.....*239
Engines, yacht, prices for.....(32) 219
England, poor..... 136
England taking a hint..... 26
Equine antelope..... *343
Erin go Bragh..... 19
Erratum.....72, 280
Eruptions, volcanic 403
Etching, steel.....(36) 396
Ether with cod liver oil..... 306
Europe, menace to..... 176
Evolution, Hæckel on 65
Excavator, Belgium..... *54
Executive ability..... 229
Exhaust pipe, Brainerd's..... 10
Exhibiti'n, agric't'ral, in London. 186
Exhibition, fishery, internation'l. 88
Exhibition, German Int'rnation'l. 163
Exhibition, international..... 288
Exhibition, industrial, Antwerp. 283
Exhibition, industrial, Mexican. 186
Exhibition, Mexican 296
Exhibition, New York, site of the. 254
Exhibition, Paris, reports on.... 269
Exhibition in Boston..... 388
Exhibition, univ. Inter., of one.. 146
Exhibition, Australian.....137, 255
Exhib'n to Shassa, Prejevolsky's.. 380
Expansion joint in steam p...(25) 410
Experience, a prairie boy's..... 384
Experiment, a promising..... 121
Experiment, promising..... 150
Explosion, ice.....(24) 219
Explosion of deflagrating matter. 115
Explosive, new..... 269
Explosion of the "Thunderer".. 283
Exposit'n, industri'l, Cincinnati. 211
Eye, regeneration of the..... 376
Eyes, care of the..... 73
Eyes, grafting upon the blind.... 228
Eyes, weak, remedy for.....(5) 59

F

Fabrics impermeable to water... 115
Faience and its manufacture.*226, 255
Faience, Cincinnati..... 56
Fain and the weather..... 292
Fair, World's, New York..... 277
Fair, World's, of 1883, at N. Y.... 240
Farm, a mammoth 34
Farm, New England, model..... 21
Farmers, Am., good times 241
Farmer's best friend, the 129
Farmers, Western, a warning to. 242
Fashion, a sensible 330
Fatally polluted stream, a..... 385
Feathers in textiles..... 297
Fence, hurdle, new *163
Fences, sod..... 266
Fender, new, for vessels..... *230
Ferments, sizes of 259
Fern valley, a..... 234
Fiber, hop..... 180
Fibers, vegetable, bleaching .. 146
File guard, improved..... *131
Files, recutting with acid.....(16) 59
Filters, water.....(41) 396
Finishing press, improved..... *386

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Firearm, new *56
Fire engines 369
Fireplace, Elizabethan *57
Fireplaces, look to your 24
Fire, put out by sunlight ..... (8) 395
Fire, waste of 145
Fires, unexpl'd, possible cause of 265
Fisheries, the Canary 161
Fish, remarkable mortality of 23
Fish show, International 41
Flooding the California desert 324
Floors asphalt and timber 325
Floors, staining 57
Floras, existing, origin of 232
Flour, American, in Turkey 265
Flour, banana 195
Flour case, important 226
Flowers in winter 266
Flowers, natural, to preserve ..(7) 409
Flowers, sex of 312
Flower standard *393
Fluid marking, for carpets ....(25) 11
Ink, writ., chem., to darken ..(4) 27
Food adulteration 129
Food, effect upon the bones ... 25
Force and fly wheels, centrifugal, 385
Forest culture pays 81
Forests, preservation of 145
Fox, Fennec or Sahara *247
Freighting, cheap 292
Frog, flying *247
Frost and the yellow fever 256
Frost bites 4
Frost, to keep from glass ....(6) 123
Fruits and veget's, evaporat'n of, 146
Furnace, Casson-Dormoy *22
Furnace, imp., for burn'g garb ..*198
Furs used for ladies' cloaks 170

G

Garden, window *295
Garment dyers, memoranda for ... 120
Gary motor, Prof. Morton on 324
Gary (Mr.) has the last word 344
Gas burning, economy in 160
Gas light, photograph by 378
Gatling gun, the 370
Geissler, Heinrich 209
Genius, mechanical, American ... 69
Geological point, doubtful 181
Geological survey of Kentucky ... 293
Glass, ancient, reproduction of ... 229
Glass, manufacture of 120
Glass mountain and road 177
Gloves, kid, to remove mildew (12) 91
Glue, marine 329
Glycerine, properties of 373
Gold medals won at Paris 354
Gold mining, hydraulic, in Cal ... 314
Goods, American, at Sheffield 116
Goods, American, in Australia ... 116
Governor, electric cur., Siemens'. *184
Governor's Island, World' Fair on 385
Grain belt, shifting of the 53
Grain mill, scientific *34
Grape phylloxera 281
Green Carolina anolis *119
Greenhouse, a cheap 325
Grid, hydraulic, new *20
Gridling the grape vine 242
Gun barrel, to brown ..... (34) 396
Gun, great, new 250
Gun tool, new *134
Gunpowder, sanitary uses of 3
Gutta percha, isolation by 101
Gypsum, crude ..... (5) 91
Gyroscope and pendulum *41

H

Habits of wild animals at night .. 391
Hair, human, color of 74
Hair, human, odor of 218
Hair, its medico-legal aspect 180
Handpiece for dental engines *117
Harbor of refuge on Pacific coast, 81
Hardware, American 388
Hardware, English and Amer'n .. 201
Hatfield, Mr. Robert G 177
Hats, soft felt, manuf. of 26
Hay press, new *371
Hays, Isaac, Dr 201
Heads, jaded 224
Headaches, rest for 85
Health and recreation 133
Heat, curious property of 310
Heat without fuel 298
Heat, radiation of ..... (28) 59
Hectograph, the 104
Heptane, a new source of 378
Hiscough, cure for 389
History, early, of electric light ... 40
Hoe, scuffle *387
Hog, penciled ear *35
Homes, old, made new *295
Homes, interlocking of 325
Honey, California 165
Honey, glucose 64
Honey extractor, new *179
Honey, ground 233
Honey, what we find in *149
Hook, whiffletree, new *118
Horograph, Wilson's *377
Horse power, what it is ..... (19) 107
Horsechestnut in rheumatism 402
Horses, saddle, English 313
Horseshoe, calk, continuous *53
Hop stems, utilization of 373
Hotbeds 234
House, building, com, mistake in, 337
Houses, dangerous 115
Houses, weatherproof 57
Hulses for workingmen 99
How coffee is cleaned 368
Hydrant, improved *330
Hyposulphite as a therapeut. agt. 357

I

Ibis, straw-necked *169
Ice, artificial 405
Ice boat, the fast 261
Ice cave of Decorah, Iowa 196, 282
Ice caves, formation of *296
Ice creeper, new *115
Ice crop of the Hudson 116
Ice making apparatus, new *166
Idiocy, condition of 229
Immigration in 1878 234
Impatience of youth 336
Imp. attachm'nt for feed pumps. *358
Index, revolving, new *18
Indicator, fire and water *102
Indigo, Guatemala 161
Induction balance *245
Induction balance, Prof. Hughes. *244
Induction coil, wires of .... (1) 395
Industrial notes 104
Industries, American 17
31, 48, 79, 97, 111, 127, 159, 177, 287, 305, 319, 337
Industries, American, new 339
Industries, manufacturing 3
Industry, an American in China. 88
Industry, a new 64
Industry, diversified 149
Infantile disorders, anointing in .. 230
Infection, new view of 3, 132
Ingenuity, perverted 74
Injector, clipper *37
Injector, the, how it works ...(24) 107
Ink, aniline black ..... (15) 218
Ink, blue, to make ..... (30) 396
Ink, for sketching ..... (3) 123
Ink, marking, recipe for ..... (6) 59
Insect pest, new 181
Insects, Australian, in California. 228
Insects as medicine 401
Inspirator, Hancock *99
Instrument, novel and curious ... 143
International Canal Congress, the 352
Invalid bed, new *403
Invention, a curious 86
Invention, hint for an 65
Invention wanted, scientific 3
Inventions, agricultural 229
Inventions, agricultural, new, 264, 280, 309, 345, 370, 408
Inventions, American, recent 179
Inventions, engineering, recent. 5, 34
Inventions, engineering, 182, 261, 293, 324, 387
Inventions, household 277
Inventions, mechanical, Am 224
Inventions, mechanical, recent, 226, 243, 275, 312, 388, 405
Inventions, miscellaneous 118, 134, 216, 228, 278, 290, 326, 339, 404
Inventions, new agricultural ..26, 41, 58, 72, 85, 163, 199
Inventions, new mechanical ..10, 22, 40, 56, 63, 86, 102
Inventions, new ...525, 37, 50, 66, 89, 98
Inventions, recent mechanical ... 166
Inventions recently patented *166
Inventions, recent *38, 230
Inventions, simultaneous 249
Inventions, some recent 154, 182
Inventors, a chance for 289
Inventors, amateur 19
Inventors, bill to discourage 49
Inventors, chance for 63
Inventors, young, an example for. 241
Inventors, women 85
Iron, advance in 201
Iron, a large contract for 85
Iron, American for China 242
Iron firm, new 325
Iron, malleable, tinning ..... (1) 123
Iron industries of Leeds 405
Iron, preservation of 180
Iron, preserving, ornamenting .. 320
Iron, preserving, new process for. 273
Iron, protecting 146
Iron, pyrophorous 180
Iron and steel polish 369
Iron and steel, product of 341
Iron in New Zealand 259, 273
Iron trade, improvement in the .. 196
Iron, white, to toughen .....(25) 395
Iron work, to galvanize .....(20) 91
Isinglass from seaweeds 260
Is science benevolent? 26

J

Javle water and chlorozone 20
Journal bearing, anti-friction 313
Journal bearing, anti-friction *278
Jubilee, cable, a 129
Jupiter's disk, black spot on 53

K

Kanchil, or pygmy musk *311
Keep to the point 80
Kerosene dangers 52
Kerosene, legal standard of 231
Knife blades, to temper .....(6) 43
Knowledge, vital 85

L

Labor and the cost of living 208
Labor in New York city 148
Labor troubles abroad 69
Laburnum, pois. props. of 407
Lacquer, black, for metal and wd 180
Lace, to clean .....(63) 219
Lamps, electric, first 17
Lamp, electric, new *184
Lamps, kerosene oil .....(1) 43
Large farming precarious 357
Lard, manufacture of *67
Lard, to keep sweet .....(32) 396
Lard oil .....(17) 11
Lattice, bronze, or fire guard *24
Lathe, foot, new *5
Laundries of New York 65
Lawson, Peter B 304
Lawn mower, improved *211
Lawn, the 216
Leaves, evap'n of moisture from. 6
Leadville, the place 266
Legal practice in London 406
Lenses .....(2) 43
Letters, copying .....(6) 395
Leyden jar .....(19) 91
Libraries, public town 80
Libraries, lar e 154
Lice on cattle 149
License fees 97
License system, objection to 368
Life saving bow, a 376
Life without air 90
Lightning conductors 388
Light and life 161
Light, albo-carbon 201
Light, velocity of 314
Lighting, artificial, for photo 296
Lightning rods, arrangement of .... (4) 395
Linen fabrics, waterproofing 249
Linseed oil, medical uses of 394
Lizard, development of the 119
Locust, shielded, or papua ..... * 87
Locomotive, a new *282
Locomotive engine, largest 50
Locomotives, Am. in Switzerland 137
Locomotives, Am. in Italy 136
Locomotives, eng., weight of ..(13) 155
Locomotion, new mode of 85
Locomotive, road and farm *102
Localizing telephone calls 353
London Int'l Ag'l Show 354
Lubricants, testing 306
Lubricene, manufacture of .....* 97
Luray cavern, the *153
Lungs, to protect the .....(24) 11

M

Machine for softening silk *150
Machinery hall, sale of 138
Machinery 26
Machinery in America 308
Machinery, therapeutic *290
Magnet, large 83
Magnetic motors 352
Magnetic motor deception, Gary. 145
Magnetism, curious facts in 194
Mangle, improved *284
Mandrel, forging, new *166
Manufacturers' troubles in Eng'd 154
Many mickles make a muckle 369
Mars, the planet 132
Marble, to polish .....(28) 123
Marble, Vermont 273
Marine silk 287
Matter, c'nd'n of in gaseous state 3
Matter, fourth state of 48
Mattresses, live-saving 145
Matches, receipts for making .(40) 60
May bug, the, in Europe 312
May meetings 361
Meat canning by machinery 209
Meat, microscopic examinat'n of 42
Meats, preserving 133
Meats, American in England 308
Mechanics, amateur *52
100, 164, 223, 340, *404
Medal for Fairbanks' scales 50
Medal for Peter Cooper, a 352
Mechanical inventions, recent ... 376
Medical colleges—doctors 373
Memphis, ancient 402
Men, practical, value of 114
Mercator, Gerard 346
Messages, teleg., thro' metal tubes 66
Metal, another new 373
Metal exhibits 90
Metals, how cast .....(2) 107
Metals, new 26
Metals, silvering, simple mode of 148
Metals, welding at low temp're .. 148
Meteor, a careless 390
Meteor in Michigan, fall of 165
Meteoric dust 330
Meteors, home of the 224
Meteorite, a large 372
Meteoric specimens, collection ... 261
Metric or decimal system 120
Metric system, the 333
Methyl aldehyd 20
Mexican exhibition 387
Microphone, the 53
Microphone, the, in mine disast's 321
Microphones, improved *324
Mildew in cotton goods 266
Milk as a soporific 168
Milk cooler *292
Milk, effect of boiling on 229
Mildew, black, of walls 248
Millers, a surprise to 177
Millers, victory for 211
Milling machine *396
Milling machinery, exhibition of. 163
Millstone furrows, draught of .(33) 396
Mind reader, canine 231
Mineral, new and important 113
Mineral and metallurgical coll'n. 241
Mine, gold, Canadian 34
Mines, placer, Ocean Beach, Cal .. 184
Mining district, Leadville 213
Mining notes 3, 67
Mirrors, Japanese *290
Modern enterprises 320
Modern engineering, triumphs of 368
Molecular chemistry 395, 353, 369
Molecular oscillations 387
Mollusk, the "Digger" 312
Monitor, who invented it .....(9) 155
Monkeys, working 215
Money by mail 137
Monopoly, a little seaport's 56
Moon, apparent changes of ....(41) 60
Moon, the, is it inhabited? 257
Morning mirage 233
Morocco 386
Mosquito, Genesis of the 282
Moss on grass lawns 387
Motor, a novel *338
Motor, Gary's *144
Motor, Gary, the *196
Motor, Gary *273
Motor, Miss Hosmer's 16
Motor, magnetic, Gary's *151
Motor, Miss Hosmer's 209
Motor, saturator and regula'r for *51
Motor, quicksilver 120
Moulding, carv'g and panel'g ma. *323
Mountain formation 53
Musical condenser, improved *6
Museums of Europe 273
Museum, Galileo's, Florence 101
Mussel, edible *345

N

Nail experiment, Gary's *242
Nails, horse-shoe manuf. of *127
National Academy, the 314
Natural history notes 6, 39, 87, 103, 135, 168, 247, 312, 392
Natural science, charms of 200
Natural science, study of 42
Neglect of rest 262
Nerves of the head, stimulation of 106
Nervous disorders 373
Neptune favors Eads 145
Neuralgia, treatment of 406
Neutral line, alleged, Gary's 177
Neutral line, Gary's alleged 208
Neutral line, Gary's 196, 242
Neutral line; note from Mr. Gary 209
New books 379
New northwest 346
New York Acad. of Sciences, the 357
New York, unknown 384
Nickel and cobalt, malleable 344
Nitric oxide, preparation of 325
Northwest passage, opening the. 368
Notes and queries 75, 139, 171, 203, 218, 235, 251, 267, 283, 299, 315, 316, 331, 347, 363, 379, 395
Noumeite 362
Novelties, a few 307

O

Oatmeal diet 42
Obelisk, the 392
OBITUARY:
Batcheldor, Samuel 128
Bissler, Heinrich 209
Hays, Isaac, Dr 201
Lawson, Peter B 304
Gen. Daniel Craig McCallum. 37
William H. Rulofson 2
Octopus at Berlin Aquarium *103
Oil, bay, pure .....(23) 11
Oil of hops, volatile 26
Oil, to extract from cod liver..(2) 91
Oer, a novel *85
Oil wells and their products 402
Oldest mine map, the 361
Orange trade in New York 24
Orange tree, large 297
Orchard, largest in the world 394
Orchis family, the *327
Ordnance, loading apparatus for *230
Organs and pianos, Beatty's 289
Organs, reed, manufacture of *111
Oxide of zinc in diarrhea 106
Oxygen, liquefaction of 106
Oysters 296
Oysters, American, shipment of. 53
Oysters, American 67
Oysters in China 310
Oysters, how freshened 131
Ozone in relation to health, etc.. 280

P

Package, sample, for mails 7
Paint, metallic, new 296, 314
Paint mine, Nevada 265
Paintings reproduced by photog. 230
Painting walls—seasonable hints 344
Page, David 346
Papaw, ferment. power of the ... 180
Paper cutting and winding mach. *310
Paper colored by electricity ..(3) 187
Paper for preventing fraud 19
Paper, impression, red .....(22) 187
Paper, new material for 170
Paper, rice, Chinese 149
Paper trade, American 88
Paper tubes to enamel .....(27) 396
Papier mache, fire proof .....(27) 187
Papyrus, errors regarding 55
Parabola .....(4) 218
Paraffine as a lubricant 72
Paraffin from a pine 404
Paris exhibition 8
Patent bill, defeat of the 234
Patent bill, how it died 177
Patent bill, new, pd. by Senate .. 96
Patent bill No. 300 144
Patent bill, the defeated 176
Patent bill, the new 112
Patent laws 192
Patent office practice 17
Patent office report for 1878. 309
Patent right nuisance, the 288
Patentees, protective association 309
Patents 364
Patents sec. 11 would have killed 64
Patents abroad, importance of .. 280
Patents, advantage of cheap 369
Patents, American, confis. of 2
Patents, American, some recent. *211
Patents, American, recent 115, 194, 214, 246, 258, 298, 325, 390
Patents, engineering, recent 131
Patents, household 133
Patents in New South Wales 32
Pavements, asphalt 9
Pay-days, weekly 165
Peanut crop, the 263
Pearls and pearl culture 170
Pedal switch, new *63
Pedometer, new, a *246
Pen, electric, new *408
Pen, electric, simple *121
Pen, stencil, new *195
Pencils, colored, for glass 216
Pencil, voltaic 63
Pendulum shg. rotation of earth *338
Pendulums, wooden 310
Pens and ink, substitute for 25
Pens, steel, who made the first ? 84
People, a strange 195
Peru, ancient works of 138
Petroleum, American, in Europe 202
Petroleum, business 372
Petroleum, deodorizing 165
Petroleum in Formosa 85
Petroleum notes 41
Petroleum, progress of 114, 311
Petroleum, refined ..... (12) 218
Petroleum springs, origin of 195
Phonograph .....(13) 218
Phonographs .....(31) 59
Phosphorescence 199
Phosphorous tin for journal bxs. 118
Photograph, a sixpenny ..... (15) 409
Photographs at midnight 226
Photographs, phosphorescent .. 388
Photographs, superb 67
Photography, blue process ....(14) 410
Photography by electric light 230
Photography in banking 225
Photography on wood 120
Physicians, Chinese 406
Physiology of the brain 71
Piano, early English style *40
Piano, strain on .....(19) 409
Pier, iron, at Long Branch 161
Piezometer, the 181
Pigment process, new 406
Pile hammer, force of .....(22) 410
Pile, ther moelectric, to make (5) *395
Pilocarpine, singular action of ... 202
Pinto's journey across Africa 248
Pipes, brier root 56
Pipes, clay, and their manuf 82
Pipes, drinking water, best ..(10) 91
Pipes, feed, choked *21
Pipe line, seaboard *225
Plague, the, in Russia 128, 273
Plain talk to Southern idlers 359
Plane, bench, new *5
Plane, carpenter's, new *1
Planer and matcher, Sweepstks .. *147
Plantains and bananas 345
Plants, carnivorous 23
Plants, cross-breeding 407
Plants protected by insects 201
Plaster, court 182
Plaster paris for Bunsen batts. (5) 187
Plastic substances, nature of 388
Pleuro-pneumonia 192
Pleuro-pneumonia, not 372
Poisoning, toad 26
Poison, roach 106
Poisons, recent facts about 42
Polariscope for testing sugar 228
Poles, telegraph, planting 148
Polishing machines, emery band *278
Pollen, a shower of 229
Population in cities 32
Porcupine, the *71
Postalcards, international 321
Postage stamps, collecting 228
Potato digger, new *67
Potteries, American 57
Pottery, gray *264
Pottery-maker and decr., prim ... 225
Powder blasts, large 329
Power, transmission of 117
Praxinoscope, the *181
Premiums for boys 261
Presence of mind 330
Preserving agent, new, alleged .. 232
Press, improved, an *214
Prevention better than cure 408
Provision safe, new *344
Public works in France 275
Pulley, clutch, new *277
Pulleys, iron and steel rim *89
Pump, lift, rotary *51
Pump, steam, Dean Brothers *243
Pump, air, locomotive .....(11) 218
Pumping money 277

Q

Quicklime a wood preservative .. 82
Quick work with wool 361

R

Railway track, novel *98
Railway, Vesuvius 240
Railway up Vesuvius 137
Rails, English vs. American 289
Railroad brakemen, danger to 211
Raisins, California 99
Railway notes 104, 148, 276, 341
Ramie fiber 345
Rats, incendiary 146
Rats in Brazil 389
Reapers, American in N. Zealand, 69
Reading and eyesight 199
Reading, taste for 193
Recent American patents 358
Recent mechanical inventions 357
Reciprocating pump, the donna'n 355
Reflector for candles *291
Refrigerating liquid from beets .. 352
Regulator, engine, novel *195
Regulator for clocks, pneumatic ..*130
Remedy worse than the disease .. 16
Reporting machine 148
Reporting, machinery 407
Reptile, a, of 12,000,000 years ago .. 184
Rheostat, the principle of .....*(13) 44
Road plane, improved *390
Rock fish, propagation of 392
Rolls, rolling mill .....*(7) 27
Roots, Philander Higley 385
Rose bush, fruit of 281
Rotary engine, new *326, *406
Round the world in a hurry 167
Rubber tubing, impervious 8
Ruler, parallel, improved *118
Rulofson, Wm. H 2

S

Sack holders and lifters *19
Safes, fillings for .....(17) 218
Safety at sea 177
Sa lrock, Louisiana 161
Sample case, new *372
Sa dpapering machine, imp'd .. *89
Satchel desk, new *323
Sausages, good 25
Saw, shop, new 403
Saw mill, band *1
Scales, Howe's, abroad 88
Scarlet fever 272, 280
Schools, country 405
Science as a detective 352
Science, indust'l, free inst. of 240
Science, nobility of 310
Science, practical value of 106
Science to solve indust'l problems 160
Sciatica, simple treatment for 390
Sciatica, two varieties of 42
Scientific Am. catalogue for 1879.. 161
Scientific exposition, Woodruff .. *83
Scientific views of nature 346
Screws, iron, wood, etc 26
Screw propulsion 324
Sea weeds for the herbarium 373
Seal, an educated 147
Sealing compound .....(3) 409
Seasickness, preventing 232
Seeds, age of 313
Seidlitz powders .....(28) 107
Self-reliance 393
Senate bill 300.—Section 2 33
Serpents, poison of 217
Sewing machines *271
Sewing and floss silk *100
Sewing silk manufacture 106
Shad in Arkansas 405
Shawl carrier, novel *246
Sharks, sucker fish, and pilot fish, 375
Shear, squaring, new *82
Shell heaps of the Alcutian Isl'ds, 215
Shells, uses of 168
Shipping, the, of New York 181
Shipbuilding in the United States 163
Shoes, wooden, how made 150
Shoeing horses 319
Side-wheeler, little, fast 7
Silk weavers, independent 394
Silk winding, electricity in 40
Silver reduction in Colorado 250
Silver from lead, separation of ... 86
Silvering, process of ..... (15) 409
Silver powder, to make .....(12) 409
Silence, advantages of 213
Siphon, automatic, new *216
Skating on artificial ice 112
Slippery streets, horseshoes for .. 85
Smoke stack, locomotive imp *86
Snakes 55
Snakes and wild beasts 85
Snakes as pets 260
Snake story, the latest 183
Snails, one that would not starve. 241
Snow flanger, improved *372
Soap bubbles .....(15) 44
Soap, bar, receipt for .....(1) 91
Social science convention 81
Society of Civil Engineers, Am ... 385
Sodom and Gomorrah 10
Sodium, uses of .....(13) 59
Soft soap, adulteration of 31
Soils, how to analyze .....(11) 187
Soldering, fluid for .....(12) 395
Some aspects of labor 361
Soot for roses 344
Sore throats, a cause of 330
Sounder, new *408
Sound, varying velocity of 380
South, the, a competitor of Eng .. 2
Southern Alaska 377
Spain, a field for machinery 193
Spar, to cut and polish .....(18) 395
Sparrow, English, the 312
Speaking tube .....(13) 395
Spectacles, Brazilian pebble ..(16) 123
Spectacles, improvement in *293
Specimens of Turkish pottery *361
Spectrum of Brorsen's comet ... 258
Spiders and ants 407
Sponges, calcarious *281
Sponge fishing in the Adriatic *167
Sponges, glass *200
Spontaneous combustion 266
Spring outlook, the 116
Sprains, treatment of 88
Stain, walnut, for pine, etc ....(14) 187
Starvation in the nursery 131
State, a thriving 259
Steel, magnetized .....(47) 219
Steel, to temper .....(4) 107
Steam engine economy 133
Steam gauge, siphon of ....(24) 410
Steam hammer, a new *358
Steam on Third avenue 385
Steam scow .....(21) 395
Steam for thawing frozen earth .. 68
Steamboat inspection 178
Steamb't, largest on the Ohio ...(1) 187
Steamship Arizona, new 401
Steamship, ocean, large 196
Steamship, ocean, large 211
Steamship Scotia 408
Steamboat, the smallest *143
Steamboat smaller than "Nina". 261
Steel surfaces, ornamenting 227
Stool of inlaid wood *361
Stomach, gases of the 230
Snake, De Kay's 217
Stone cutting, revolution in 138
Storm, singular, a 246
Strikes in Liverpool and London. 128
Strike of Pittsburg puddlers 384
Stubs or Stubbs .....(22) 155
Studies, solar, Mr. Lockyer's 90
Study to have ideas 288
Stove, car, new *96
Sub-treasury, fortifying the 82
Substitutes for gold and silver ... 330
Subterranean telegraph system .. 309
Successful efforts, three 320
Sugar making, possible imp. in .. 241
Sugar manufacture, imp. in 400
Sugar, manufacture of *47, 49
Sugar, honey 161
Sugar in the northwest 162
Sulphides as fuel in metallurgy. 250
Sulphur for diphtheria 38
Sumac, American 345
Summer flowers in winter 71
Sun spots and commercial crisis. 32
Sunless weather near London 179
Surgical operation, curious 25
Survey, Adirondack 117
Surv'ys, national, directorship of. 217
Sweat on show windows .....(19) 59
Swift, Capt. W. H 354
Swine in the United States 200
Switch controller, new *339
Szegedin, calamity at 228

T

Table, cast iron, fine *233
Table, improved 50
Table, ironing, new *194
Table moving .....(18) 410
Tables, black walnut, to polish .(5) 123
Tables, turned, the 261
Tag, shipping, new *211
Tanning, revolution in 131
Tar, coal, painting trees with ..(1) 27
Tattooing, modern 65
Tea, American 96
Tea shrub, new 113
Teeth, gear .....(3) 43
Telectroscope, the 143, 309
Telegraph, grounds for .....(26) 395
Telegraph, mirror 294
Telegraph, return wire for ....(2) 395
Telegraph, writing 196
Telegraph, writing, Cowper's *197
Telegraph wires, subterranean ... 105
Telegraph wires, underground ... 325
Telegraphic conductor, new 170
Telegraphing without wires 104
Telegraphy, aerial 115
Telegraphy, ocean, progress of .. 195
Telephone, a, 28 years ago *261
Telephone, bell 233
Telephone concert 343
Telephone, electro-chem., Edison. *200
Telephone in church 408
Telephone in Philadelphia 38
Telephone, progress of the 104
Telephone, progress of the 176
Telephone, the latest 377
Telephone, Righi's *186
Telephones ....(13) 218
Telephones and sounders *282
Telescope, costly 74
Telescope, great Russian 387
Temperance society, novel 117
Temperatures, high 1 1
Temperatures, spectroscopic 90
Tenements, model 176
Teredo, a protection against 112
Terrestrial gasteropods *359
Testing machine 179
Testing machine, great 150
Textile industries of Finland 264
Theory and practice 6
Thermometers .....(43) 60
Thermoscope and hydroscope ... 17
Thrasher, straw scale, etc *339
Threading machine, new *374
Thread, spool, manufactures of ..*287
Thrift of French working classes. 184
Thoughts and weather, gloomy .. 179
Thunderbolt, Bawlkin Green *169
Tide water oil pipe line 400
Tigers' toes, trimming 248
Tiller, steam, new *191
Tin plates, manufact'e of in N.Y. 338
Tinned ware, lead poisoning ...t .. 208
Toads, utility of 247
Toadstool, green spored 312
Tobacco manuf'y, Lorillard's ..15. 17
Toil and be happy 1
Tool, combination, for mercha's *387
Tool works, Miller's Falls *175
Torpedo boat, American 105
Torpedo launch, Herreshoff *210
Torrey Botanical Club 304
Tortoise shell, to polish .....(61) 219
Tow, a large 330
Town, oldest and coldest 220
Toxicological notes 229
Toys, machinery for manuf. of ... 82
Tracing the Hudson under the sea 282
Trade, American, with Japan 88
Trade arbitration in England 129
Trade depression in England 1
Trade marks 88
Trade marks quandary 33
Trade route, another sub-arctic .. 166
Train the boys for business 82
Trajectory of molecules, the 352
Tree, argan 233
Tree, a wonderful *121
Tree, mahwa 39
Tree, pottery 200
Tree, the papaw 74
Trees, teredo-proof 80
Trichinæ 71
Trough, watering, for cattle *227
Tubes, glass .....(6) 11
Tongue, fur on the 408
Tunnel, longest in the world 304
Tunnel, St. Gothard 115
Tunnels, railway, St. othard 181
Turbine, Victor *166
Turtle, hair, musk, hair on the ... 3
Turtle, snapping, giant *183, 228
Typhoid fever 165
Type writer, improved *98

U

Underground telegraph wires 352

V

Valve, butterfly, to fit .....(24) 395
Valves, safety .....(22) 11
Vanilla beans, cultivation of 298
Vapor densities, new method for 106
Varnish, alcoholic shellac .... (50) 219
Varnish, black, cheap .....(14) 218
Vase, Alhambra *137
Vase, Greek, ancient *199
Vases, designs for *73
Vault, bank, granite for .....(16) 155
Vegetable, a gigantic 170
Ventilation of ships at sea 340
Vermont marble, alleged 325
Vessels, submerged .....(38) 396
Vesuvius, last eruption of 24
Vibration, power harnessed 304
Violin, rosin .....(11) 409
Vise, parallel, double screw *7
Vitriol, effect on skin .....(42) 219
Volcanic eruptions 403
Volcano, supposed, in the moon .. 7
Volume XL 400

W

Wagon, steam, new *116
Walking anatomy of 181
Want, the great 138
Washer cutter, improved *163
Washing machine, improved *217
Watch faces, self-illuminating ... 180
Water, clarification of 377
Water, cold, in cold weather 161
Water colors, how mixed .....(1) 107
Water, fall of in pipes .....(15) 395
Water fowl, strange freak of 248
Water wheel, current .....(23) 410
Waterworks, Baltimore 241
Waterworks, Chichester *18
Wax, glider's, how made .....(4) 187
Wax, mineral, Utah 117
Wealth, path to 73
Weaving, antiquity of 53
Weights that timber will sustain 322
Whale, humpback *135
Wheat farm, Dakota 294
Wheat, fruitfulness of 370
When America was named 389
When are laws discovered ? 304
White lead, manufacturing 180
Whooping cough and fungus 120
Whooping cough, remedy for 298
Why so depressing 214
Will blood tell ? 96
Wind engine, new 386
Wine from oranges 56
Wine, red and white 178
Windmills, angle of various ..(35) 396
Window cornice, improved *387
Winged projectile, a new 376
Wire for electro-motor .....(8) 11
Wire for magnets, to insulate (33) 50
Wire in wheat 225
Wire, manufacture of *319
Wire straightener .....(16) 44
Woodbury planing machine case 113
Wood, cherry, to ebonize .....(18) 91
Woodcock, three-legged *23
Woodcroft, Bennett, F. R. S 181
Wood, ebonizing .....(9) 187
Wood, pavements in London 229
Woodruff, James Orton 385
Wood, to preserve .....(12) 395
Wood, to render incombustible .. 67
Wood, unconsidered uses of 263
World's age, new estimate of ..288, 304
World circuit and time puzzle ... 321
Writing telegraph, the *376

Y

Yak, the *295
Yacht, steam, little, fast 38
Yachts, steam .....(2) 155
Yellow fever, cost of the 24
Yellow fever in winter 189
Yokes, neck, improvement in *115

Z

Zinc, action of water on 4
Zoological garden, postal 295

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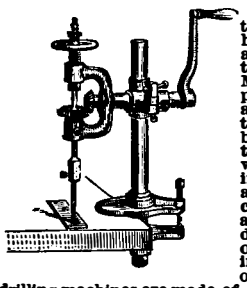

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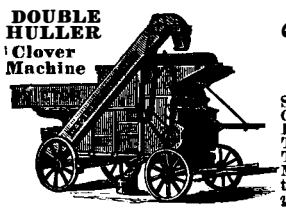

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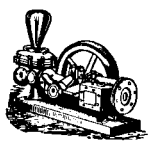

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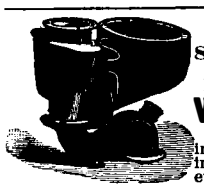

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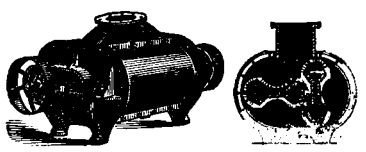

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